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A PLAN AND DESCRIPTI
OF
Mr. JOHN STEWART
FIRE ENGINE MILL,

BEING

A MACHINE to apply the Power of FIRE ENGINES to all Kinds of MILLS that require much Force, but is moſt profitable to grind Sugar Canes; as one of them, with a Cylinder of Thirty Inches Diameter, is proved will do as much as four Cattle Mills, that employ from 160 to 200 Steers; and the Traſh of the Canes, that works the Fire Engine, boils the great Coppers at the ſame Time, without any additional Expence, or Conſumption of Fuel.

AND

A Plan and Deſcription of the Application of a Fire Engine to work Saws, that will be next moſt profitable to ſaw Timber, as the Slabs, or Branches of the Trees ſawed, will ſupply Fuel without Expence, particularly in *North America*, as they may be ſet in the moſt convenient Situation for Timber and Navigation, *&c.*

ALSO

A Plan and Deſcription of a Reſervoir, to be made of Earth, that will be as ſtaunch as Ciſterns made of Stone and Lime, and grouted, and a Method of collecting Rain Water to ſupply them, as is practiſed in the *Eaſt-Indies*, and other Countries ſubject to long Drought.

Likewiſe, a Plan and Deſcription of a Sliding Rod, that, by the Fire Engine, which grinds the Canes, will work a Pump at a Diſtance of 400 Yards or upwards, from the Engine, and raiſe Water, that may be conveyed in Wooden Gutters, ſet on Poſts or Pillars of Stone, to any higher Ground, that may be convenient to let into Cane Pieces to water Canes.

Alſo a Deſcription of Marles, ſuch as uſed in moſt Parts in the North of *England*, to manure Land which the Patentee hath ſeen of the ſame Kinds in Parts in *Jamaica*, but it is not known to be Marle; or the Value of it, or the Uſes and Benefits to be had by it.

A further Deſcription of the ſaid Machines &c. is given in the Preface.

With an Account of the Oppoſition and Diſtreſs the Patentee met in *Jamaica*, by Means of a Millwright, who impoſed on the greater Part of the principle Gentlemen of the Iſland, by ſhewing them a Draught of a Counterfeit of the Patentee's Invention, that had two Wheels leſs and comparing it with a Draught of the Patentee's that was publiſhed, to believe it to be more uſeful, altho' it will herein appear, that it was an imaginary Invention, and that the ſaid, Millwright uſed every diabolical Means, he could contrive, to depreciate and hinder the Patentee's Invention from coming into Practice.

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A

PLAN AND DESCRIPTION OF Mr. JOHN [illegible] FIRE ENGINE MILL

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BRITISH MUSEUM 29 APR 70

INTRODUCTION.

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THE Occaſion of publiſhing this Pamphlet, is to let the Publick know, the Reaſons why the Fire-Engine Mill has not come into general Uſe, which will be ſeen in the annexed Letter to ſome Gentlemen, who aſſiſted the Patentee, by their Subſcriptions, to make a Trial of it in *London*, where it was often worked, and approved of, by the ſaid Gentlemen, and many Engineers in *London*; alſo, a Committee, appointed by the Society of Arts and Manufactures, who reported, that it deſerved the Society's Medal; and after was approved in *Jamaica*, by many who ſaw it work; particularly by a Gentleman who purchaſed it, and after many Trials of it, he paid the Patentee for it; but the Patentee was unfortunate in taking it to *Jamaica*, in the firſt Year of a deſtructive Drought, which continued Three Years, and ſetting it on an Eſtate, that had not conſtant Water to work it any conſiderable Time.

The Millwright, mentioned in the Title Page, by the fraudulent Means he uſed, as mentioned therein, but will more fully appear in the ſaid Letter, and by advertiſing, that he would make Fire-Engine Mills, and giving out, that he was making one to prove it, many Gentlemen were diverted from making uſe of the Patentee's, expecting to ſee a more ſimple and better Machine: But his Invention has turned out to be a Water Wheel, and Fire Engine to raiſe Water to turn it, that is done in many Works in *England*, which, with a Cattle Mill, and Mill-Houſe, &c. coſt £.1800 more than a Fire-Engine Mill.

It will be neceſſary, for any Gentleman, who may intend to have Fire-Engine Mills, to take off the Crop in 1777, to give Orders to the Manufacturers of the Iron, Lead, and Braſs Work, ſoon, and Directions to their Attornies, in the *Weſt-Indies*, to provide Timber, *&c.* or contract with Millwrights and Maſons to find Materials; the Patentee will give Directions for making the Iron, Lead and Braſs Work of the Materials, to be ſent abroad; and if any Gentleman ſhould reſolve on having any made in *London*, it will be neceſſary to give Orders ſoon. The Patentee, or, in his Abſence, ſome Perſon for him, will give Advice to Gentlemen who may reſolve to have Fire-Engine Mills, or Saw Mills, and will endeavour to find Men, who underſtand to direct the putting them up, and to inſtruct Negroes to work them.

Letters directed to the Patentee, at the *Jamaica* Coffee-Houſe, (Poſt-paid) will be received, and anſwered.

An Objection may ariſe to the making the Wheels of Oak, as the Patentee hath ſaid; the laſt Wheels that were ſent were replaced with Wheels of hard Timber, in *Jamaica*; but the Reaſon was given, that the Oak Wheels were damaged, by being expoſed to the Weather; the Mill ſtood out Six Months in *London*, before it was ſhipped, and lay ſome Time on the Wharf in *Kingſton*, and, after it was put up in *Jamaica*, was not covered for a conſiderable Time; had they been painted, which was neglected, they would not be much the worſe. Mr. *Lemon* propoſes to paint what Wheels he makes; and if Orders are given to keep Wheels under Cover, they will be as good as Wheels made of hard Timber, in *Jamaica*; the Rollers were not the worſe for the Weather, as they ſtood an-end, and was partly covered with the Work over them. Further Obſervations on Oak Timber for Wheels will be ſeen in the Pamphlet.

The Levers are 24 Inches ſquare, and 21 Feet long, they are uſually made of one Piece in *England*, and coſts conſiderably more than ſmaller Timber, in Proportion to the Quantity, and is expenſive to bring to the Works; but the Patentee made the Lever on Sir *Charles Price*'s Eſtate, of four Pieces, joined with Dove-Deals, without any Iron, that is better than in one Piece, for they uſually twiſt or open.

The Patentee learns, that many People from *Jamaica*, have reported in *London*, that the Fire-Engine Mill will not anſwer the Deſign, which was commonly reported there, and believed by many People; but any Gentleman who will be pleaſed to peruſe this Pamphlet, will ſee it fully proved, to be groundleſs; and that the ſaid Reports were contrived, and induſtriouſly propagated by Mr. *Dugald Clarke*, the ſaid Millwright, and the Overſeers of two Eſtates the Patentee erected two Mills on, to depreciate the Invention, and favour a Counterfeit, which the ſaid *Clarke* ſet up.

ERRATA.

In the Reaſons.

Page.	*Par.*	*Line.*	
6	11	3	*for* Nuttivar, *read* Nut-River.
9	19	26	*for* roll on, *read* roll.
21	42	16	*for* Overſeers, *read* Overſeer.
21	42	18	*for* will, *read* would.
27	56	5	*dele* including the ſaid work.
27	57	11	*dele* it.

In the Preface.

Page.	*Line.*	
7	8	for *Mixon*, read *Nixon*.

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P R E F A C E.

THE deſign of this Preface is to give the Reader a further deſcription of the uſes and benefits to be had by the machines mentioned in the Title Page, *viz.*

The annual benefits which may be had by a Fire Engine Mill to grind canes, in preference of cattle mills, are very great; for there may be ſaved, by keeping breeding cattle in place of 95 ſteers, that work only two cattle mills, £.1039 7*s.* 6*d.* which appears by annexed eſtimates; beſides £.2884 may be ſaved in ſettling new eſtates, which appears by an eſtimate annexed alſo; and a fire engine mill may be made and put up in three months time; for there are only about 300 perches of ſtone work, of one foot thick, in the walls, and any common negroe maſon can make two perches of ſuch wall in a day, ſome three; ſo that ſix negroes, in 25 days, may compleat it; and many maſons will contract to find the materials, without expence of labour to the eſtates; another advantage is, that no timber is required larger than 12 inches ſquare, and 21 feet long, and only four pieces ſo large, the reſt not more than 17 feet long, and from eight to eleven inches ſquare, for beams, and the roof (for the houſe that is only 13 feet wide in the clear) except timber for the rollers, and a bridge tree, the bed is made of plank; and if they are built on eſtates where there are cattle mills, the rollers and frame they ſtand in will ſupply the place of them, that will leſſen the expence. The patentee is of opinion, that ten carpenters, properly attended, may compleat the timber work in two months, which the Plan will ſhew is

not

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not conſiderable; and the beams and roof may be of pitchpine, which in cattle mill houſes are neceſſary to be of hard timber, as it is difficult to keep them ſtanch, and to get timber ſo long, as is neceſſary for the corner ſpars; and much time of negroes and cattle is loſt in bringing home ſo great a quantity of hard timber, as is neceſſary for the roofs, for it is difficult to keep them dry; and it will not ſo ſoon rot by getting wet as pitchpine or oak.

Mr. *John Lemon*, of *Lambath-ſtreet, Goodman's-fields, London*, is the mill-wright that built the firſt of them, for the patentee in *London*, in 1768; he propoſes to build one or more of them for any gentleman who will employ him, and to ſet it upon a frame of wood, and prove it in work to grind oziers, as he did before; and it may be taken to any of the iſlands, and ſet up to work in three weeks time, after it is brought to the eſtate; for all the ſtone work neceſſary is a wall, about twelve inches high above the ſurface of the ground, for the ſil to lie on, and to dig a hole for the boiler, and a ſtoke hole, except the ſetting the boiler, and making a chimney about 25 feet high.

It will alſo require about 2000 feet of plank, inch thick, to ſheet it, that is uſually ſold in *Jamaica* for eight pounds a thouſand, that currency, and about twelve thouſand of ſhingles, that is ſold in *Jamaica* for about 45 ſhillings a thouſand, of cedar. Mr. *Lemon* propoſes to find all materials, except the boards and ſhingles, and to ſet it up, and prove it, in *London*, for 620£.

Some objection was made to the machine he built in *London* being ſet on a wood frame, and the machinery being of oak, *viz.* That an inſect, called a wood ant, deſtroys ſoft timber; but the Patentee, while he was in *Jamaica*, made particular enquiry of experienced carpenters, and finds, that wood ants build

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build neſts only in the roofs of old houſes, that have not been kept in repair, and in other parts of buildings, where it is cloſe and moiſt; but it is ſoon ſeen where they are in any part of a building, by the roads they make to their neſts; and if ſome arſenick is mixed with malaſſes, and rubbed on any part of thoſe roads, they leave the building directly.

The greateſt part of the houſes in *Port Royal* and *Kingſton* are built with pitchpine, and other kinds of fir, from *North America*; ſome of them are ſaid to be a hundred years ſtanding, many of them ſixty; and where the roofs have been kept dry, the timber appears to be as ſound as in houſes built of fir in *England*.

As to the wheels and rollers being made of oak, the Patentee avers, that if he was to make a mill for his own uſe, he would prefer it to hard timber, except for cogs; for the cogs would ſtick better in the mortiſes, and would not require ſo frequent and ſevere driving; and hard wood being brittle, the ſpaces between the cogs frequently break out, and in a ſhort time the rollers are rendered uſeleſs, which ſeldom would happen to oak rollers, as it is tough, as well as of ſufficient hardneſs and ſtrength, which appears in many mills in *England*, that are of as great force, particularly mills to roll iron and copper, that require much greater force than a fire engine mill; for the force on the rollers of wind-mills, in ſtrong breezes and water mills, when over-fed, and much water is let on the wheels to force the canes through the rollers, and cattle mills, by whipping the cattle when the mill is over-fed, give double the force they uſually do, or ought to do, in common work, by which cogs are broke, and other damages done to ſuch mills.

But the power of fire engine mills, being the atmoſphere, is always very near the ſame; and the great execution they do is chiefly owing to the velocity, the rollers going five times round in a minute, and a cattle mill only once; therefore it does not require ſo much force on the cogs of the rollers as a cattle mill does in common work, although it will do four times as much work, and will not damage the cogs near ſo much.

The Patentee is of opinion, that a frame of a houſe for a fire engine mill, of *Dantzick* or *Norway* red fir, if the roof, *&c.* is kept in repair, and the frame ſecured from the weather, by being ſheeted with feather edge boards, as framed houſes are, and painted, or a coat of tar, and oaker on it, and kept in repair, may laſt ſixty or one hundred years, except the under ſil, and the tenors of the poſts that are ſet in them, which may, in 20 or 30 years, decay, which can be repaired, at a ſmall expence, by ſhoring up the poſts, and putting in another ſil and tenors, *&c.*

It may be objected, that the wooden frame may not be ſteady, and may ſhake; as fire engines in *London* make a noiſe, as if they ſhaked the buildings; but it was ſeen, by the working the mill in *London*, that it did not make any ſuch noiſe, or ſhaked any part of it, except at the rollers, and that very little; and by ſetting a piece of timber, by way of a brace on each ſide of the houſe, oppoſite to the rollers, it was as ſteady as if the work was on ſtone walls.

Some gentlemen, who were pleaſed to attend the working it in *Jamaica*, that will be mentioned in the annexed letter, are now in *England*, were pleaſed to ſay, they had not ſeen any ſugar mill work ſo ſmooth as it did.

A man experienced in working fire engines may be employed to work each mill, that may be made in *London*, and may go with them, and work them and ſtruct negroes to work them, and direct the putting them up, which muſt remove any cauſe of doubt or diſappointment.

The Patentee therefore recommends it to gentlemen, who deſire to have the uſe of thoſe mills ſoon, to have them made in *London*, at leaſt for ſome years, until ſome of them are ſet up in each of the iſlands, eſpecially as they will come cheaper, and there cannot be any miſtakes by workmen, until they are in general uſe, to avoid diſappointments by workmen not underſtanding them.

About one half of the expence of the mills is the iron, lead, and braſs work; if any gentleman, who contracts with Mr. *Lemon*, will order his factor in *London* to give orders to the manufacturers of theſe, they will readily give twelve months credit for them.

Feather edged boards may be had at the ſaw mill in *London*, for ſheeting them, that will come as cheap as *America* timber; and the roofs may be covered with the ſame, which may ſupply the place of ſhingles, ten or twelve years, and at any time ſhingles may be nailed on them.

A material obſtruction, which prevents the fire engine mill being in general uſe in *Jamaica*, is the want of water in many eſtates, where the proprietors are ſatisfied of the utility of the machine, and that it will anſwer the deſign where water can be ſupplied; but the Patentee has found a method of making reſervoirs of earth, that, he apprehends, will appear by demonſtration, will hold water, as well as reſervoirs that are made of ſtone and lime, that are grouted, and will make old ponds that do not keep water ſtanch alſo; by which every plantation in the *Weſt-Indies* may be certain of water, to ſupply fire engines, and every other uſe of plantations, at a ſmall expence, which will be ſhewn in the annexed Deſcription of them.

Fire engine mills to ſaw timber in *North-America*, being ſet on frames of timber, may be removed, when the timber is cut in one part, to the next convenient, for a ſmall expence; it is preſumed, the expence of erecting them will not come to ſo much as mills that are worked by water uſually do, including the making dams, ſinking and piling, to make foundations, &c. that are frequently undermined by freſhes, and the dams broke down, ſometimes the mill houſes, and work of the mills, carried away, and in many ſituations, much time is loſt, by want of water in dry ſeaſons.

They are alſo preferable to windmills, for they are ſubject to damage, by ſquals, and are difficult to manage, uncertain their working, and expenſive to keep them in repair; and a windmill, ſuch as that in *London*, to ſaw timber, would coſt as much as three fire engine mills, altho' it will do more work; for fire engine mills may work 40 or 50 ſaws, or as many as a windmill does, and may work conſtant.

Whereas a windmill, on an average, does not work eight hours in 24, to do as much work as a fire engine mill does conſtant, while it is ſupplied with fuel, &c.

The ſliding rod to work a pump may be worked to raiſe water at all times, when the fire engine is not grinding canes, particularly on *Sundays*; and when the negroes are weeding canes, they may in thoſe times raiſe as much water as will be ſufficient to water canes in crop time, if a reſervoir is made to ſave it, and at all other times of the year. An objection may be made, that there are few eſtates, that can ſpare fuel for the purpoſe of raiſing water, it being only ſufficient to boil the ſugars, and ſupply the ſtills; but it will appear, by the annexed Eſtimates, that eſtates, that make uſe of wood to boil coppers, may be ſupplied with coals, at leſs expence, and the benefits, which are to be had by watering canes are ſo great, that the expence of coals can be no reaſonable objection.

The accounts in *Jamaica* of the benefits the French in *Hiſpaniola* have, by watering canes, were incredible, and were not believed, until about two years ago Mr. *John Mixon*, late of St. *Thomas in the Eaſt*, ſince deceaſed, employed a man that was uſed to it, in *Hiſpaniola*; and, on land that was not reputed to be very good, it produced from two to four hogſheads an acre; and one piece of thirteen acres produced fifty-four hogſheads, as the patentee was credibly informed.

Marle lies under any ſort of ſoil, but for the moſt part under poor ſoil, the deſcription of it is, *viz.* It is either red, brown, yellow, blue, grey, or mixed, is known by its pure and uncompounded nature, and by its breaking into little ſquare bits, its falling into pieces by a blow, or being expoſed to the froſt, its feeling fat or oiley, and ſhining, when it is dry and rubbed with the finger; but the moſt unerring way is to break a piece of it, as big as a nutmeg, and when it is quite dry, drop it to the bottom of a glaſs of clear water, and it will diſſolve into mud in a very ſhort time, ſhooting up ſparkles to the ſurface.

It is much uſed to manure land in moſt parts of *Lancaſhire*, *Cheſhire*, *Derbyſhire*, *Staffordſhire*, and other parts; and is of ſuch value in manure, that £.5 an acre is given in ſome parts for caveng, or raiſing it, and laying it on land to manure an acre, being carried in ſome parts ſeveral miles; ſome farmers have told the Patentee, that it ſtrengthens poor land ſo much, that it is better by it, for fifteen or twenty years.

It is a very ſtrong loam, and ſome of it makes excellent bricks, tiles and earthen ware; it is preſumed,

ſumed, *Marles* being ſo plenty in thoſe counties is the reaſon ſo many manufactures of thoſe kinds of ware are in thoſe parts of *England.* A very good kind of this *Marle* appears in each of Sir *Charles Price*'s four eſtates before-mentioned, in 16 miles walk; alſo in an eſtate, called *Treadways*, belonging to *Henry Dawkins*, Eſq; and an eſtate, called *Marche's-All*, in ſixteen miles walk; and ſeveral other eſtates in that neighbourhood. Mr. *Martin*, of *Antigua*, in a book he publiſhed on ſugar planting, ſays, he has of it on his eſtate, and uſes it to great advantage.

It will not be believed in hiſtory, that a machine of ſo much importance to the ſugar iſlands, as a fire engine mill, after being tried, and approved of in *London*, in the year 1768, by many ſugar planters, engineers, millwrights, and a committee of the ſociety of arts and manufactures, and in *Jamaica*, in the year 1769, was approved of by the gentleman, who purchaſed it and paid for it; but by a deſtructive drought, that continued three years, for want of water and canes, could not be worked a ſufficient time to ſatisfy the public; a millwright in the iſland made a handle of it, to inſinuate and impoſe on many gentlemen, to believe that it was complexed, and would not anſwer the deſign, and ſet up a counterfeit of it, that he ſaid was ſimple, and uſed every diabolical means that could be invented to prejudice gentlemen againſt the Patentee, and his invention, and impoſed on them, from time to time, to believe, that he was making one to prove it, until of late the fraud was diſcovered, that he had no ſcheme, that had any probability of anſwering the deſign, but an imaginary one, although he obtained the King's Patent for it, which may be readily had by any who ſwears their invention to be new, and obtained a law of the iſland, for the ſole uſe of it.

He alſo influenced the overſeers of the two eſtates, which the Patentee erected mills on, to deprive the machines of water, fuel and canes, and to depreciate the invention, by falſely reporting that it would not anſwer the deſign, and, magnifying the expence and trouble to eſtates of erecting them ten-fold, prejudiced the greater part of the overſeers, as well as their employers againſt it, which will appear by the annexed letter to ſome gentlemen, who aſſiſted the Patentee to make the firſt trial of the machine in *London*.

The chief expence of ſugar Eſtates, that have not water mills to grind canes, is allowed to be the grinding them with cattle; it is allowed, by ſenſible planters, that an eſtate that employs two cattle mills would be worth ten thouſand pounds more by having a water mill; many have laid out from five to ſeven thouſand pounds, ſome ten thouſand, to bring water to ſupply ſuch mills; and I have not ſeen a water mill work, that did ſo much execution as the mill on *Burton*'s did, while Juſtice was done to it.

To the Overſeers of Sugar Eſtates in the Iſland of Jamaica.

GENTLEMEN,

Being credibly informed, that many of you and your employers have been impoſed on, to believe many falſe and groundleſs reports of me, and my invention of the Fire Engine Mill, which has prevented the Public from making uſe of it ſeveral years paſt, I have thought it incumbent on me to publiſh the annexed Pamphlet, by which you will ſee, that the ſaid reports are groundleſs, and that they were contrived, and induſtriouſly propagated, by Mr.

Dugald Clarke, millwright, and ſome men employed by him, with deſign to defraud me of my right, by ſetting up a Counterfeit of my invention.

I publiſhed a Paper in the year 1772, that ſhewed the moſt malitious, unprecedented practices of one of them, that is the Overſeer on Mr. *Pinnock's* Eſtate, to deprive the Machine of water, fuel, and canes, which you will ſee in the 33d paragraph of the 17th page, that put me under a neceſſity of letting the Public ſee the injuſtice done me and them, which had the good effect to ſatisfy ſome Gentlemen, who before had been impoſed on to believe the ſaid reports, and had given over all hopes of the Machine anſwering the deſign, to aſſiſt me, by a ſubſcription, to erect another mill, where there could be no diſappointment, by want of water or otherways, to ſatisfy the Public, which I did on an Eſtate belonging to Sir *Charles Price*, Bart.

It has been boaſted, by the friends of Mr. *Clarke*, that the publiſhing the ſaid Paper gave offence to the greater part of the overſeers in the Iſland, and that they had declared, they would oppoſe the invention coming into practice: But many overſeers I have talked with, concerning the injuſtice done me, and the proprietors of the eſtates they were on, which appears in the ſaid pamphlet, and they were pleaſed to ſay, that he, the ſaid Overſeer, or any who would oppoſe or obſtruct ſo uſeful an invention, ought to be ſtigmatized, and not to be named among overſeers.

I was an overſeer of a ſugar eſtate in St. *Croix*, and have the greateſt eſteem for every honeſt man of the profeſſion, and I hope none is ſo weak to look on it as a diſreſpect to the profeſſion, while I expoſe a man that had impoſed on the Public to depreciate my invention; there are good and bad men of all profeſſions, and the Preſs is of great uſe to expoſe the evil actions of men of all profeſſions, the greateſt are not ſpared. The Eſtate I was overſeer of was worked by a windmill and a cattle mill, and the greateſt trouble I had in crop time was in getting the cattle properly drove, and taken care of, and the windmill that was in danger of damage every ſquall.

It was thoſe inconveniencies, and the great expence of cattle, that put me on thinking of applying the power of Fire Engines to grind canes, being well acquainted with the principle and power of them; and their being the greateſt mechanical power known, and no power ſo much under command, and more certainty to work, which is proved by all the Mines in *England*, being kept dry by them, and the City of *London* ſupplied with water chiefly by them: Alſo my application of that power to ſugar mills, proved and allowed by many millwrights in *London* and *Jamaica* to be ſimple, and that it muſt anſwer every purpoſe of the beſt water mills when Juſtice is done it.

I have made the annexed Plan and Deſcription of the Fire Engine, and the application of it to the Sugar Mill ſo plain, that none of you can be at a loſs to ſee that it is ſimple; and that there is no difficulty in working them appears, as negroes worked the Mills that are erected, ſo that you cannot have any reaſon to doubt of its anſwering the deſign; and as you muſt know, that the expence of grinding canes with cattle conſumes the greateſt part of the profits of ſugar eſtates, that are worked by cattle and mules, which the annexed eſtimate ſhews, in a more clear light than is generally underſtood, although the loſs by ſteers, that work the mills, in the ſaid eſtimate, being two out of twenty, that die yearly by hard work, accidents, *&c.* is allowed in general to be much more on an average; and the loſs to Planters that work the mills with mules is much more than by ſteers; for when the glanders get among them, frequently from ten to forty die in one year, which coſt £.30 each. I am credibly informed, that in *Jamaica* one gentleman loſt 50 mules in one year; and eſtates ſeldom get clear of the diſtemper for ſeveral years after ſuch grievance.

Theſe loſſes and expences by cattle diſtreſs many of your employers, who grind canes with cattle or mules, and make it inconvenient for them to pay your ſalaries ſo punctually as they would deſire; but it will be removed by uſing Fire Engine Mills, and you will be eaſed of a great deal of trouble and anxiety, which you have in crop time, to get cattle and windmills properly attended.

I flatter myſelf therefore, that each of you will take theſe things into your conſideration, and let any of your employers, who have been impoſed on, by the ſaid reports, to believe unfavourably of the Fire Engine Mill, ſee, that they were impoſed on, and that you will encourage them to uſe them, ſince you will ſee that they are cheap, and may be put up with very little hinderance or trouble to the eſtates; for the ſaving by cattle in one year will be more than the whole expence of the Machine, beſide the benefit will be had by the labour of 2160 negroes in crop time, to get crops taken off in leſs time, which will enable you to get the plant in earlier.

A handle has been made of the wheel, mentioned in the 34th page, being broke, to report that the Mill is difficult to keep it in repair, although it is a part of the Sugar Mill, and no part of my invention; and you know every water-mill, and windmill, is ſubject to the ſame accident; but it is the opinion of every millwright, I have let know, that there were five cants broke out of twelve, of which the wheel was made, that it could not be done by fair working, or by any means, but by puting a piece of timber, or iron, between the nut and the wheel, when it was working.

I had reaſon to believe it was done by the negroe boatſwain, who is mentioned in page 34 to have altered the wedging the rollers, to depreciate the invention, which was done by ſetting the roller on the feeding ſide very cloſe, and on the returning ſide wide, by which a great part of the traſh was returned twice, therefore could not do near ſo much execution, or grind the canes ſo dry; as it does, which appears, by the certificates of *George Aſhly Reid*, Eſq; Mr. *George Forbus*, and 20 more; and in page 29, who certify that it ground the canes very dry, without returning any, that is a ſecond time.

But I have found a method, to prevent ſuch accident, for the future; that is to lay a piece of timber on the top of the mill frame and bolt it to the frame, one end of it to come under the cant of the wheel, a few inches on the outſide of the wheel, directly under the nut, and to make a mortace in it, to let in a roller of about three inches diameter, and an inch and a half long in it, with an iron ſpindle of half an inch diameter, to go through the mortace and timber in the roller, for the bolt to go through the piece of timber; the bolt to have a head on one end, and a key on the other end; the roller to be ſet within a quarter of an inch of the cant; this will prevent the wheel from ſinking, more than the diſtance between the roller and the cant, for all wheels, when the mill is high fed, ſpring leſs or more, the arms being in general from three to five feet long, ſome ſix feet from the centre of the roller; ſo that the arm ſprings, or the wedging gives way, by which means the cogs in the nut take hold of the cogs in the wheel, nigher the ends of the cogs in the wheel than it ought, and are broke; but the ſaid roller will prevent the wheel from giving way, any more than two perpendicular wheels do, that work on each other, and if any thing ſhould be put between the nut and the wheel, it can only break one cog and ſtop the mill.

I earneſtly requeſt, that every proprietor of an eſtate, who makes uſe of a fire engine mill, will have it ſecured in this manner, before it works; for beſide the ſafety of the wheel, the friction of the cogs will be leſſened by it; and if it is done in windmills, and water mills, it will be a ſafety to them alſo, and they will work eaſier.

The overſeer of Sir *Charles Price*'s eſtate, called *Burtons*, in 1774, induſtriouſly reported, that the Fire Engine Mill made ſo many ſtops that it would not do ſo much execution as two cattle mills, and that it conſumed more fuel than any Eſtate could ſupply; and that he ſaid ſo was made a pretence, for not allowing the ſaid mill to work in crop 1775; but what credit ſhould be given to his report will appear by his conduct in crop 1774 which may be ſeen in page 33, &c. where it appears, that he ſwore he would do every thing in his power to prevent me ever geting any thing by my invention, and accordingly did every thing he could to deprive the mill of fuel, &c.

But it appears by the aforeſaid certificate of *George Aſhly Reid*, Eſq; and Mr. *George Forbus*, now chief manager of Sir *Charles*'s Eſtates, who were appointed by Sir *Charles* to attend a trial of it, which was atteſted by them and twenty more, chiefly overſeers, and they all to a man ſigned it; a copy of their report may be ſeen in the annexed letter, page 29, by which it appears that it muſt do as much as four cattle mills, as they certifyed alſo that it made few ſtops, and that in their opinion, it would anſwer the deſigns; and Mr. *Hamilton*, a maſon, who worked for Sir *Charles*, who alſo built the ſtone work of the mill, certified, that he was ready to make oath, when required, that he ſaw it work, and that it kept three negroe women very buſy to ſupply it with canes, and it would have taken more, which certificates may be ſeen in the 30th page.

The objection on account of the fuel had no exiſtence before crop 1774, for Mr. *Pinnock* had a public trial of it in crop 1771 which was certified by him, *William James Hall*, Eſq; Major *Crane*, Mr. *Carmichael*, overſeer of *Swallow-field*, and a good many more, which was publiſhed in the St. *Jago* Intelligencer of the 9th *March*, 1771.

After this, Mr. *Pinnock* inſiſted on his overſeer letting it work every day, which it did for the moſt part for ſix weeks, part of the day, ſo long as it was ſupplied with cool water, fuel, and negroes to attend it, which will appear in the annexed letter, to be very little, for he deprived it of cool water, as well as attendance. One inſtance of his malice to me, and injuſtice to his employer, is unprecedented, *viz.* In the time of crop 1772, he employed the labour of upwards of 100 negroes in carrying water in jars, and drawing water out of a well, 160 feet deep, to cool the coppers, and worm-tank, and fire engine boiler, &c. at a time there were 999 puncheons of water in a pond, that ſix negroes in one day could let down by opening a trench about twelve inches wide, that was before made and uſed for that purpoſe, and would deliver it into a ciſtern, that was made to cool the injection water, and could be raiſed by the engine pump, to keep a continual ſtream running into the worm-tank and the hot water to return to the cooler, for which purpoſe gutters were fixed, which would ſave much labour alſo; yet the reports of theſe men have been aſſerted to be true; and by the expectation of Mr. *Clarke*'s invention being better, gentlemen have been diſcouraged from uſing them.

About the month of *May* laſt, on letting ſome of the Gentlemen in *Hanover*, St. *James*'s and *Trelawney* pariſhes know, what kind of a Mill Mr. *Clarke* was making for Mr. *Chambers*, they told me that they were greatly diſappointed, for they had been informed and expected that he was making one, that was much more ſimple, and cheaper than mine, and let me know, ſince they were ſo diſappointed, they would aſſiſt me by a ſubſcription, to have one of mine erected in that country, to ſatisfy them, and the public, next crop, accordingly the following gentlemen were pleaſed to ſubſcribe, *viz.* Sir *Simon Clarke*, Bart. £.40, the Hon. *John Campbel* Eſq; Cuſtus of *Hanover* £.50 *Thomas James*, of *Spring*, jun. *John Robert James*, *Henry Cunniff*, *John Tharp*, *Patrick Hanlan*, Eſqrs; The Hon. *William Barnet* Cuſtus of *Trelawney*, *John Jarret*, *John Simpſon*, *Thomas Joſeph Gray*, *John* and *William Moody*, *John Crawford*, *James Campbel* of *Duenvale*, *C. Delap*, The Hon. *Alexander Fullerton*, Cuſtus of St. *Ann*'s, *Hugh Barnet*, *Patrick Starling*, *Philip O'Conner*, and *John Erſkine*, Eſqrs; £.40 each, the whole amounting to £.810. The greater part of the ſaid gentlemen, gave promiſſory notes, to pay one half of the ſaid ſums as ſoon as the work was begun, and the whole as ſoon as it took off 100 Hogſheads, of Sugar, in as ſhort time as two cattle mills uſually do. The iron materials I have in the Iſland, value £.380 currency; ſeveral workmen were willing to undertake the work; but I could not find a Plantation in that part, where there was water convenient, and a gentleman living on their eſtate; and being told, that the greater part of the overſeers in the Iſland would oppoſe it, I did not think it prudent to ſet people to work, ſo near Mr. *Clarke* as I could not attend them myſelf for I was determined to come to *London* in the fall, to let the public know, the Reaſons why the Fire Engine Mill was not in general uſe.

It may be objected, that the cylinder of the Mill on *Burton*'s eſtate is larger than that on Mr. *Pinnock*'s, and will require more fuel; but I have reaſon to believe it does not; for by an improvement I made on that of Mr. *Pinnock*'s, that is in place of 8 feet diameter. I made that on *Burton*'s 7 feet wide and 10 long ſo that the fire place and grate do not require to be ſo large as for Mr. *Pinnock*'s, for traſh fuel, and do not conſume more fuel, although the ſurface of the water in it is 70 ſuperficial feet, and in the other only 36; ſo that it muſt produce double the quantity of ſteam; for ſteam is produced in proportion to the ſurface of the water in the boiler.

I underſtand that you, and the publick in general, have been impoſed on, to believe the reports before mentioned that fire engine mills are ſubject to damage, and will be expenſive to keep them in repair, and will be difficult to manage, which was a very ſufficient reaſon for overſeers to be againſt uſing them, while they believed it. But it appears in the annexed letter, that the only colour he had for the ſaid report was, ſome damage that was done the machine in that crop, by his not allowing more than one negroe to feed it, when he muſt know, that two could not ſupply it conſtant with canes; and by working twenty-one days and nights, and not being fed conſtant, ſome ſmall damage was done, but not more than might be expected from any new mill of much leſs conſequence in the firſt working, beſide being in the care of the negroe boatſwain ſo ill diſpoſed to it, as one of them before mentioned was: but it will appear to any underſtanding millwright, or engineer, that will examine it, that it is not ſo ſubject to damage, or difficult to manage, as either a water mill or windmill, *viz.*

Water mills have always been allowed to be the beſt machines to grind canes, but there are few of them, that are not ſubject to many accidents, and diſappointments, particularly by high freſhes breaking dams, and other damages, others not having conſtant water in crop time; and negroes by overfeeding the mills, and letting much water on wheels, to force the traſh through, frequently break gudgens of rollers and cogs, and they often let ſticks or blocks of wood through the gate on the wheels, which break the buckets, ſo that by theſe much time is loſt, beſide a conſiderable expence in repairing them.

And windmills you will allow to be uncertain, as they depend on the wind, and are in danger of damage every ſquall by the vanes and arms breaking, or ſails tore, and the roof ſometimes blown down, conſequently very expenſive to keep in repair, and much time loſt.

That the Fire Engine Mill is not ſubject to any accident, to ſtop the work ſix hours at one time, and that very ſeldom during a crop, if the work is made as ſtrong as for water mills; which will appear to every perſon of middling underſtanding, who knows any thing of ſugar works, or any mill-wright and engineer of fire engines, who will be pleaſed to examine the annexed plan and deſcription of one, will admit that a fire engine mill is much preferable to a water mill, for the following reaſons, *viz.*

It is proved, by their ſupplying the city of *London* chiefly with water, and keeping mines dry, that they are the greateſt and moſt certain power known; and if the horizontal wheel on the middle roller is ſecured, in the manner herein deſcribed, it will not be in the power of a negroe to damage it, by neglect or otherways, than by wilfully breaking ſome part of the work, that muſt appear to be wilfully done; and that not in any thing, that cannot be repaired in a few hours; for the power, being the atmoſphere, as before, the force is always the ſame; wherefore negroes cannot force it, as they do water mills, it will only ſtop, and can be ſet to work again in a few minutes after; whereas negroes frequently break gudgens of rollers, and cogs of cattle mills, by whipping cattle to clear mills, when over fed.

Fire Engines appear at firſt to be a complexed Machine, by many parts appearing, *viz.* Some leaden pipes to convey water for the injection, and to keep the packing of the ciſtern wet, a pump, which the engine works, to raiſe the ſaid water for ſaid uſes as ciſterns to receive it; alſo a ſmall piece of timber hung to the lever, that, by moving up and down, opens and ſhuts the injection cock and regulator, alternately, and three ſmall pieces of iron, that move to open and ſhut the injection cock, and regulator, which will appear in the annexed plan and deſcription.

Engineers in *London* have told me, and I believe that a fire engine, when new, does not coſt 20*s*. a year, to keep it in repair, for the firſt five years: and the friction of the cogs, that apply the power of it to the ſugar mill is not more than one wheel working on one another for the cog wheels work alternately on the cog wheel on the nut; and the force on the ſaid cog is only one third part, as much as on the cogs on the rollers.

The lever and chains ſuſtain all the force, and the chains being made of bar iron, inch and quarter thick, cut in pieces of about nine inches long, with a hole in the end of each, for bolts to join them together, they may work twenty years with little repairs; in ſugar works; they will work only about one third part of the year; and the greater part of the engines in *England* work the whole year, and require little repairs, in twenty years; the only repairs they require is, that, when by long working conſtant, the bolts wear, they are taken out, and others put in, that is ſoon done, as they are faſtened with keys, and when the links wear, ſo as one of the chains comes to be any longer than the other, ſome of the links are taken out and others put in, for which purpoſe there are, or ſhould all always be links ready; and the links taken out may ſupply another place; wherefore I cannot ſee how it can exceed twenty ſhillings a year in repairs, at leaſt many years; if the lever is kept dry, or until the boiler is wore out, and requires a new one which may be in 12 or 15 years, and will coſt about £.80 for when a hole breaks in it, it is ſtoped, at little expence. The method is to make a plate of iron or copper, ſomewhat larger than to cover the hole, make a hole in the plate, and put a ſmall bolt of iron through it, with a piece of iron on the end of it, to make a T, with a hole for a key on the other end, to lay the plate in the inſide, to cover the hole; the bolt is put through the hole in the bottom, and is faſtened by driving the key in the inſide, till it is drawn tight by uſing waſhers, then it is caulked with okeam, between the plate and the boiler, in the inſide, which may all be done in two or three hours time, after the boiler is ſo cool as a man can go into it, which may ſoon be done, by letting out the hot water, and putting as much cold water in it.

The fuel uſed in *Jamaica* to coppers in the ſouth ſide, and ſome parts of the north ſide, is mill traſh, without any wood; and it is proved herein, that mill traſh works the fire engine mill very well, without any wood, and boils two great coppers at the ſame time; but in eſtates that uſe wood, the traſh, beſides ſupplying the taich, ſupplies the great coppers alſo, about one half of the crop, that is about forty five working days, which, on *Burton*'s, took about ſix hundred loads of copper wood, as ſeveral of Sir *Charles*'s overſeers told me, to ſupply the coppers the other half. This quantity will ſupply the fire engine one half of the crop, and boil the ſaid coppers, if the wood is cut, ſix months, or upwards before crop, and is corded to dry; for I am credibly informed, that dry wood is uſed in *France* and *Germany*, to make glaſs, conſequently muſt flame as much as coals. But although green wood will work the fire engine mill, I am not certain, that it will keep a flame to boil the coppers at the ſame time; for it is allowed to be the worſt fuel for coppers, as it is wet, in the heart, and does not produce flame, after the bark is conſumed.

I have in order to inform Sir *Charles Price*, and other Gentlemen who have eſtates, that lie convenient to rivers, for fire engines to raiſe water to water canes, particularly *Henry Dawkins*, Eſq; who has a ſugar work, called *Dawkins's Commanders*, that joins Sir *Charles*'s plantation, called the *Farm*; and the works are about the ſame diſtance from the river, at what expence they may ſupply a fire engine with coals yearly to water canes.

By what I can learn of the quantity of water to water an eſtate of 300 acres of canes, a fire engine, with a cylinder of 30 inches diameter, ſuch as that on *Burton*'s, would in ſix hours raiſe as much water as would ſupply it 24 hours, which would be about 91 days and nights in a year, that a fire engine would require to be ſupplied with coals, to raiſe water to water canes; but part of the time will be ſupplied by wet weather; and if there is a reſervoyer and drains to collect rain water, ſuch as deſcribed in the annexed Plan, a great deal of coals will be ſaved.

Now it appears, by the annexed affadavit of *John Walk*, engineer of the fire engines and water works, at *Shadwell*, in *London*, that the cylinder of one of the ſaid engines is 29 inches diameter, and the other 29 inches and an half; that he frequently took an account of the coals each of them conſumed, and found they took two buſhels an hour each. Mr. *Walk* alſo makes oath, that the account I have given of the ſimplicity of the fire engine, and expence of keeping fire engines in repair, and the certainty of their working, is true.

I am informed, by a coal factor, in *London*, that coals are ſhipped, in *Newcaſtle*, for eight ſhillings a chaldron, and about two ſhillings and ſix-pence charges, is twelve ſhillings and ſixp-ence, and the price at *Liverpool* is about the ſame, but at *Briſtol* is three or four ſhillings more.

The

	£.	s.	d.
The expence of coals to raiſe water, by a Fire Engine, to water canes, one year, is, *viz.* 120 chaldrons, at 12*s.* 6*d.* firſt coſt	75	0	0
The uſual freight in bulk is 20*s.* *per* chaldron - - - - - - - - - - - -	120	0	0
	195	0	0
Difference of currency, 40 *per Cent.* -	78	0	0
Currency	273	0	0
But it is preſumed, that gentlemen, who may have uſe for large quantities, will charter ſhips, to bring the coals; and if they contract to load them back, a hogſhead of ſugar for every chaldron of coals, they will make no charge for the freight of the coals: This ſeveral commanders of ſhips have told me will be readily done, which would leſſen the expence of the coals, £.120 Sterling is	168	0	0
A Year	105	0	0

Eſtates that uſe copper wood may ſave conſiderably, by uſing coals in place of it; for the time to cut it is uſually a ſhort time before crop; it employs the ableſt of the negroes a month or ſix weeks, at a ſeaſon that generally is wet, and the roads deep, that damages cattle ſo much, they frequently are not able to take off the crops, and is the occaſion of many dying, beſide the labour of the negroes, and cattle bringing the wood home, is worth more to the eſtate, than the coſt of the coals, and the freight alſo.

Middleſex. } *John Walk*, Engineer of the Fire Engines and Water Works of *Shadwell*, in *London*, maketh Oath, and ſaith, that he hath frequently meaſured, and taken an Account, of the Quantity of Coals uſed to work each of the ſaid Fire Engines; and, to the beſt of his Judgment and Belief, they take each of them Two Buſhels an Hour on an Average, and ſaith; that the Cylinder of one of them is Twenty-nine Inches Diameter, and the other Twenty-nine and an Half; and he could not perceive which of them took moſt Coals.

And further ſaith, that he hath peruſed the ſaid Mr. *Stewart*'s Plan and Deſcription of a Fire Engine, that is publiſhed in a Pamphlet, intitled, A Plan and Deſcription of Mr. *John Stewart*'s Fire Engine Mill, with an Account of the Simplicity of it, and Expence to keep a Fire Engine in Repair, and Certainty to work, which, to the beſt of his Knowledge, Judgment, and Belief, is true.

John Walk.

Sworn at the Publick Office, at
Shadwell, the 26th *Feb.* 1776,
before me, *John Sherwood.*

When Sir *Charles*'s overſeers reported, that the Fire Engine took more fuel than the eſtate could ſupply, to remove that objection, although there was no foundation for it, I ſhewed them, that it could be ſupplied with coals, at leſs expence, than the cutting and waining 600 loads of wood, it took to ſupply the coppers one half of the crop; beſide a large tract of land it takes up to grow the ſaid wood on; it is preſumed, at leaſt 20 acres, that takes ten yeas to grow, which would bring a conſiderable yearly profit, if it was planted with guinea graſs, that might be done at a very ſmall expence, in the method lately found to be the beſt, *viz.* As ſoon as the copper-wood is cut, the ground is planted at ten feet diſtance; at the ſame time plant it with Indian corn, a good crop of it may be had without hurting the graſs; that may pay a great part of the expence of gathering and burning the branches, and traſh that is on the ground, and planting the corn and graſs, which is all the expence, except the fencing, which is uſually done with poles, or poſts and rails, that ſerves ſome years, until hedges or ſtone fences are made; this is found to be the cheapeſt and moſt profitable way of reclaiming wood land, for the graſs grows ſo high, that it keeps down moſt of the ſuckers from growing.

Land, that is ſo rocky and ſtony that there is very little ſoil to be ſeen, and was of very little or no value before, produces very good crops of guinea graſs, that ſtands drought better than the natural graſs.

It is preſumed, that the land kept for copper-wood, in moſt eſtates, ſo planted, would be worth forty ſhillings *per* acre, and upwards, yearly, on an average; for when the corn is taken off, cattle are let in to eat the graſs; that, with the wind, ſcatters the ſeed over the whole ground, ſo that one acre of guinea graſs produces more food than two or three acres of common paſture, and fattens cattle, *&c.* much faſter.

Now it appears herein, that coals to ſupply the Fire Engine 45 days, at two buſhels an hour; is 71 chaldrons, at £.1 12*s.* 6*d.* Sterling is £.115 7*s.*6*d.* or £.161 10*s.*6*d.* currency, including the freight, which is not near ſo much as the damage to the eſtate and cattle, excluſive of the land employed; one chaldron and a half would be a moderate load for a wain, ſo that 48 wain loads would bring 71 chaldrons, which, at two buſhels an hour, at moſt, would ſupply the place of copper wood, that could be brought at the moſt convenient times, when the roads are dry: And if eight ſteers ſhould be kept conſtant for this uſe, there would ſtill be ſaved the expence of keeping eighty-ſeven, and it would not employ the ſteers one half of the year, ſo that there would be the work of 91 ſaved.

City of *London*, to wit. } *ſs* *John Stewart*, of the Iſland of *Jamaica*, Patentee of the Fire Engine Mill, maketh Oath, and ſaith, that, to the beſt of his Knowledge, Remembrance, and Belief, and Information, he has Reaſon to believe, that the Contents of a Paper, intitled, Reaſons why the ſaid Fire Engine Mill is not in general Uſe, in the Iſland of *Jamaica*, in a Letter to ſome Gentlemen, who are Proprietors of Sugar Eſtates in *Jamaica*, and the *Winward* Iſlands, that is publiſhed in a Pamphlet, intitled, A Plan and Deſcription of *John Stewart*'s Fire Engine Mill, is true; and ſaith, that if there ſhould be any Error, with reſpect to Time or Place, or any other Thing, it is not with Deſign to aggrevate the Injuries done him; and further ſaith, that, in all the Trials he has made of the two Fire Engine Mills, he erected in *Jamaica*, he never had any Reaſon to doubt of them anſwering the Deſign.

And further ſaith, that the ſaid Machines are ſo little ſubject to accidents or difficult to manage, that he is certain that with a Cylinder of Thirty Inches Diameter, ſuch as in the Engine on Sir *Charles Price*'s Eſtate, called *Burton*'s, that ſuch Mills will take off Crops, with as much Certainty and Diſpatch as very good Water Mills, or as Three or four Cattle Mills, worked with Steers, provided they are ſupplied with dry Mill Traſh, Wood or Coals, and if it is fed up to the Power and Velocity, which, in this Deponant's Opinion will require Three Negroes to feed it and cut the Straps that ought to be done in every Mill, for they will take in canes ſo faſt, that two is not ſufficient to feed one of them.

John Stewart.

Sworn this 1ſt day of *March*,
1776, before me, *John Sawbridge*, Mayor.

City of *London*, to wit. } *ſs.* *John Lemon*, of St. *Mary, White-Chapel*, Millwright, maketh Oath, and ſaith, that, in the Year 1768, he made a Fire-Engine Mill for Mr. *John Stewart*, in *London*, and ſaith, that it was worked often in *London*, when it ground Oziers, in Preſence of a great many People each Time, many of whom, he was informed, were Sugar Planters, Millwrights, Engineers of Fire-Engines, and a Committee from the Society of Arts, and Manufactures, and by what he could learn, at that Time, or heard ſince, it was approved of, by all who ſaw it work, particularly by the ſaid Committee, who agreed on the Spot, and ſigned the Report, recommending the ſaid Mr. *Stewart* to the Society, to be deſerving their Encouragement, and a Medal.

And further ſaith, that he hath peruſed a Pamphlet, intitled, *A Plan and Deſcription of Mr. John Stewart's Fire-Engine Mill*; and has examined the Plans and Deſcriptions of it, and Two other Machines, to be worked by Fire-Engines, *viz.* One of them to work Saw Mills, the other to raiſe Water, at the Diſtance of Four Hundred Yards, or upwards, from the Fire Engines; and that he hath examined the Principles of the ſaid Plans and Deſcriptions of them, and is fully ſatisfied of the Principles of them, that if the Work is properly executed, and made ſtrong in proportion to the Work to be done, they will anſwer the Deſigns.

And further ſaith, that if the Horizontal Wheel on the Middle Roller of the Sugar Mill is ſecured, in the Way Mr. *Stewart* has directed in the ſaid Pamphlet, it will prevent breaking them by any Thing being put between the Nut and the Wheel; and, in his Opinion, there is no other Accident the Fire-Engine Mill is liable to in working, unleſs by wilful breaking ſome of the Work, that could be repaired in a few Hours; and ſaith, that when the ſaid Mill was worked in *London*, it was often worked when there were no Oziers, or other Things between the Rollers, and it made little Alteration, except that the Motion was ſomewhat quicker; and ſaith, that he has good Reaſon to believe, it will anſwer the Deſign as well as a very good Water Mill.

John Lemon.

Sworn this 1ſt day of *March*,
1776, before me, *John Sawbridge*, Mayor.

BRITISH MUSEUM

PATENT OFFICE LIBRARY

REASONS

Why the ſaid

FIRE ENGINE MILL

Is not in general USE

IN THE

Iſland of *JAMAICA*,

In a LETTER

30.1.13.

To ſome Gentlemen, who are Proprietors of Eſtates in the ſaid Iſland, and ſome Gentlemen, who are Proprietors of Eſtates in the Windward Iſlands, who were ſo publick ſpirited to aſſiſt the Patentee, by their Subſcriptions, to erect one of them in *London*, to make the firſt Trial of it, in the Year 1768; and to the Publick in general, *viz.*

The Heirs of the late Sir *Alexander Grant*, Bart. who began the ſaid Subſcriptions, and *Simon Clarke*, now Sir *Simon Clarke*, Bart. *Arnold Neſbit*, Eſq; *Henry Dawkins*, Eſq; *Edward Morant*, Eſq; *Edward Chambers*, Eſq; *Richard James Laurence*, Eſq; *Thomas Hall*, Eſq; *Thomas Storer*, Eſq; and *Robert Gordon*, Eſq; of *Briſtol*, Proprietors of Eſtates in *Jamaica*; Sir *William Young*, Bart. *William Matthew Burt*, Eſq; *Duncan Grant*, Eſq; *L. Maclane*, Eſq; *James Simons*, Eſq; *John Anthony Rucker*, Eſq; *John His*, Eſq; *Richard Oliver*, Eſq; *John Halliday*, Eſq; *John Deponthien*, Eſq; ——— *Laurant*, Eſq; *L. A. Rockard*, Eſq;

GENTLEMEN,

1. I TAKE this liberty, in behalf of the Publick, as well as myſelf, to acknowledge great obligations, for the generoſity, and publick ſpirit you ſhewed, in ſubſcribing to aſſiſt me to erect the ſaid Fire Engine Mill in *London*, to prove my Invention, and I ſhall anſwer your queries, why it is not in general uſe, *viz.*

2. After the many trials I made of it in *London*, in the year 1768, and approbation it met from you, and the gentlemen of the windward iſlands, who were pleaſed to ſubſcribe alſo, and to attend the working it, and the approbation of a committee of the Society of Arts, and many principal engineers in *London*, and that it was proved, after working very well with coals, that it worked as well with a ſmall quantity of wheat ſtraw, I could have no reaſon to doubt of its coming immediately into general uſe; the only doubt you ſeemed to have of it, was, that it might require another fire beſide what boiled the coppers, and were then pleaſed to deſire, I would take it to *Jamaica*, and prove if it could be worked by the fuel uſed to the coppers, and if it did not require a ſeparate fire, you would make uſe of them; and at the ſame time told me, that when I let the legiſlature in *Jamaica* know, what you had done out of your private purſes, to bring it ſo far, I might be

aſſured, they, and every ſugar planter, would encourage and aſſiſt me to bring it into general uſe, but I found it quite otherwiſe; for when I arrived in *Jamaica* with it, that was in *December*, 1768, the Aſſembly was ſitting, and the Machine, being in poſſeſſion of the attorney of ſome gentlemen in *London*, to ſecure payment of Money that was advanced, to aſſiſt me to erect and try it, I could not get the poſſeſſion of it, to make the trial, to ſatisfy the Publick, until it was paid or ſecured; that, with the freight and charges, amounted to 350*l.* ſterling.

3. I, in a petition, let the aſſembly know my caſe, and the hopes you gave me of their aſſiſtance, and prayed only for a grant of a loan of the ſaid ſum, on a mortgage on the Machine, to enable me to get poſſeſſion of it, to make a trial of it the enſuing crop; but notwithſtanding I had the countenance and protection of his excellency the governor *Trelawney*, and council, alſo of the ſpeaker, and many worthy members of the houſe, it was oppoſed, and after a long debate, the houſe divided, and it was carried by a very ſmall majority.

4. In a ſhort time after, I diſcovered the reaſon of this oppoſition, *viz.* Mr. *Robert Grant*, Millwright, who was brother and heir to Doctor *Grant*, of *Papain*, in St *Andrew's*, told me, he gave Mr. *Dugald Clarke* a plan and deſcription of the Fire Engine Mill, I gave him in *London*, a year before I arrived with it; that Mr. *Clarke* then told him, he could make improvements on it (which it is preſumed, he might imagine he could do) for I learned ſince that he impoſed on many worthy members, that was in the oppoſition, by ſhewing them my plan, and by a falſe explanation of the principles of it, poſſeſſed them with an opinion, that it was complexed, and would not anſwer the

deſign, and ſhewing them a draught of a Machine that had two wheels leſs, and appeared more ſimple, although on the ſame principle.

5. Soon after ſeveral trials of the Machine in 1769, on Mr. *Pinnock*'s eſtate, that met general approbation; Mr. *Kinian* and Mr. *Clarke* came to the plantation, when Mr. *Pinnock* told Mr. *Kinian* (Mr. *Clarke* and I preſent) that it was tried, and he was ſatisfied it would anſwer the deſign when it could be ſupplied with water.

6. Mr. *Clarke* then examined it, and ſoon after returned, and ſpent a conſiderable time taking dimenſions of it, which appears by the affidavit of Mr. *Alex. Lecky*, then a book-keeper, on the ſaid eſtate, and procured letters from ſome of the gentlemen who were moſt active in the oppoſition, to gentlemen in *London* and *Briſtol*, recommending him as being ingenious, and having diſcovered a more ſimple and better method, and by ſhewing the ſaid plans, and ſome models he got made in *London*, that appeared more ſimple than mine as before, but by taking away the two wheels, was rendered as uſeleſs as a clock would be, if two of the wheels were taken from it; but he obtained the king's patent, that is readily granted to any who ſwears their invention to be new, although it could be of no uſe to him, only to impoſe on gentlemen, to believe he was ingenious, and had a power he had not; for in all patents and laws to encourage invention, it is provided, that it ſhall not impower the patentee, to make uſe of any counterfeit, or any part of a machine, for which there was a patent or law before.

7. In the year 1769, I went to *London*, with a full proof of the trial of the Machine, and of the fuel uſed to it, not being more than is uſed to two great coppers, hung to one fire, and that it boiled

the coppers at the ſame time. But I found that you and other gentlemen, who were pleaſed to aſſiſt me to make the trial of it in *London*, were impoſed on by Mr. *Clarke*, or the letters he brought from *Jamaica*, to poſtpone ordering any of them, until Mr. *Clarke*'s ſhould be tried, and on my return to *Jamaica*, ſeveral gentlemen there, who had reſolved to have of them, told me the ſame. It is amazing, how a perſon ſo ingenious, as Mr. *Clarke* was recommended to be, could be ſo much miſtaken, as appears he was, for after his return to *Jamaica*, he laid a model of his imaginary invention before the aſſembly in 1771, and obtained an excluſive law for the ſole uſe of it in *Jamaica*. But .

8. The ſaid model was examined by many millwrights, and others, and allowed to be on the ſame principle of mine, but that the alterations to diſguiſe it, would make a machine on that plan, of no uſe at all, which a perſon of very ſmall underſtanding in machinery may ſee.

9. The fees of the ſaid patent muſt have coſt Mr. *Clarke* at leaſt 95*l.* ſterl. and the law 40*l.* currency, which is a demonſtration, that he was ſatisfied, by informations he had in *Jamaica*, and in *London* (and probably might have ſeen it work in *Jamaica*) that it would anſwer the deſign, otherwiſe, he would not have been at ſo much expence, to get a power to make a counterfeit of it, and if he had any expectation of his counterfeit anſwering, it is preſumed he would have erected one or more of them before this time.

10. But although in a paper I publiſhed, at the meeting of the aſſembly in *October*, 1772, in order to bring his invention to a teſt, to ſatisfy the publick, gave him liberty to try one, alſo obliged myſelf to pay him one hundred piſtoles for the firſt bundle of canes it ſhould grind, and diſcharge

him of any penalty he might incur, by erecting it, although it was a counterfeit of my invention, yet I cannot learn, that he has taken any ſtep to erect one of them.

11. It was then given out, that Mr. *Clarke* was erecting a Fire Engine Mill, on an eſtate belonging to Sir *Thomas Champney*, Bart. on *Nuttivar*, in St. *Thomas*'s in the Eaſt, that was much more ſimple, and better than mine; but when it was compleated to be fit for trial, it was found to be a Fire Engine, and a pump to raiſe water to turn a wheel, that was on the eſtate, when the water failed; exactly on the ſame principle practiſed in many parts of *England* to raiſe water, to turn wheels to work furnace bellows, at iron furnaces, and other uſes; but he did not conſider, that a cylinder to raiſe ſo large a quantity of water, as would be ſufficient for that purpoſe, would require a much larger quantity of fuel, than a Fire Engine Mill, or any eſtate could ſupply; for after conſuming a large quantity of mill traſh and wood, in trials of it, it could not be worked; and after working a very ſhort time with coals, it conſumed ſo much, that it has not been uſed ſince, as I am credibly informed.

12. But notwithſtanding this, and my propoſal to encourage Mr. *Clarke* to try his invention, was generally known, being publiſhed, and ſatisfied many, who before believed he had a better method than mine, then ſaw clearly the contrary, that one machine muſt be more ſimple and better than two. I preſume Mr. *Chambers*, although one of the firſt ſubſcribers to my invention in *London*, being in *England*, did not hear of it, and was encouraged by the character he had in *England* of Mr. *Clarke* and his invention, depended on Mr. *Clarke*, and he adviſed him to have a water mill, and a fire engine, ſince he muſt ſee that his coun-

terfeit would not anſwer the deſign, for Mr. *Chambers* was not in *London* at the time the firſt trial was made of it, or when I returned to *London*.

13. It being reported, that Mr. *Clarke* was erecting a machine for Mr. *Chambers*, in *Hanover*, that was much ſuperior to mine, that was believed by moſt gentlemen in the North and South ſide, and that he would take off the crop in 1775, with it; I went to *Hanover*, where it was making, and found it in the latter end of crop, not near compleated, and to be on the ſame principle of that at Sir *Thomas Champney*'s, the wheel 36 feet diameter, the cylinder of the ſame dimenſions of Sir *Thomas*'s, a dam made of ſtone and lime, and filled with earth, to raiſe water, and ſtone guttering along the ſide of an hill, a conſiderable way, with trunks of plank, to bring the water to run down to the ſole of the wheel, then riſe 40 feet in a trunk to run on the wheel, beſide a great depth ſunk to let the wheel down, and ſtone work on each ſide of it, that muſt have coſt at leaſt ſix hundred pounds more than the whole expence of a fire engine mill, that would do twice as much execution, with a cylinder, that I preſume, will not require ſo much fuel by one half, and the fuel would boil the great coppers at the ſame time, excluſive of the expence of a cattle mill houſe, and mill, computed at 1200*l.* more, in all 1800*l.* that was quite unneceſſary, had a fire engine mill been built; for Mr. *Clarke*'s fire engine being larger than would be neceſſary for a fire engine mill, with the pumps and other work about it, muſt coſt conſiderably more than a fire engine mill. I ſaw Mr. *Clarke* at the work, and aſked him how he could adviſe Mr. *Chambers* to ſo expenſive a method, when he muſt know, that a fire engine mill would anſwer the deſign much

better, to which he replied, that gentlemen did not underſtand them ſo well as a water mill.

14. After I viewed Mr. *Chambers's* works, I heard that *Dugald Malcum*, Eſq; of *Hanover* pariſh, a gentleman of conſiderable fortune, and excellent character, was Mr. *Clarke's* principal friend and benefactor, and that he had recommended him to many gentlemen.

15. I waited on Mr. *Malcum*, and told him of the injuſtice Mr. *Clarke* was doing me, by depreciating my invention, and ſetting up a counterfeit of it; but I learned from Mr. *Malcum*, that Mr. *Clarke* had impoſed on him, to believe the invention was not mine, that the like was done before, and that he had as good a right as I had. I am confident, that if Mr. *Malcum* did not believe this, he would not have recommended him; and alſo, that nothing but ſome ſuch reputable recommendation, or other good reaſon to believe it, could prevail with ſo many worthy gentlemen, as the members who oppoſed my petition, firſt for the loan, and afterwards oppoſed another petition for a law, to aſcertain the damages to be recovered, of thoſe who ſhould counterfeit my invention, which was neceſſary for an eaſy way to recover the damages of thoſe who ſhould counterfeit it; I ſay, that nothing but a full conviction, that I had impoſed another man's invention on the publick, that would not be ſo uſeful as Mr. *Clarke's*, could have prevailed on them to diſcourage a perſon, who had laid out his all, on a machine of ſo great utility, and brought into the iſland, with proofs of the approbation it met with in *London*; and after proving it in the iſland; for the legiſlature of *Jamaica* is remarkable for encouraging improvements on ſugar mills, and works. One inſtance is, they granted Mr. *Young* 250*l.* for each licenſe for an

improvement on cattle mills, by friction wheels, that could only ſave part of the cattle, and had it anſwered the deſign, was much inferior to mine; and they lent three thouſand pounds lately, intereſt free, for ſix years, to encourage a foundry.

16. I therefore think it incumbent on me, to let you and the publick ſee, that thoſe aſſertions are falſe and groundleſs, as will appear, *viz.*

17. In the year 1767, I publiſhed a pamphlet, with a plan and deſcription of my invention; in it I ſaid, I was informed that ſeveral had attempted it, but none before me had brought it to perfection.

18. This information I had from Mr. *John Maſſey*, who was then engineer of the fire engines and water works at *Shadwell*, whom I employed to direct the erecting the work of the fire engine part.

19. When I firſt mentioned it to him, I, at the ſame time told him, I had the king's patent, for the ſole uſe of them; he replied, I had laid out my money to little purpoſe, for it had been tried about two or three years before, as I remember, in miniature, by ſmall fire engines, by two different perſons in *London*, and was found that it would not anſwer; he ſaid he was employed by one of them, who expected it might roll on watch ſprings, that he, Mr. *Maſſey*, uſed his beſt endeavours to make it do, but could not, and ſaid the owner and he gave it up, as not being practicable, and he believed it had not been made any further trial of.

20. Mr. *Maſſey* ſaid he made it to work a little, by working the fire engine by hand, to command the velocity, by regulating the ſteam as engineers do, when they begin to work, to raiſe water to fill the pumps; for when the pumps are full, the water in them is a balance for the atmoſphere on

the piſton, that preſſes on it with a force equal to 5000 pounds, on a cylinder of only 24 inches diameter, that is at leaſt ſix times as much force as that model; but he ſaid, that when the materials between the rollers was not conſtant, a weight of about 300 pounds, that was uſed to divide the power of the atmoſphere, fell with velocity on the ground, that occaſioned ſuch a ſhock, that it diſturbed the work, and made it impracticable to anſwer the deſign, and would deſtroy the work of a common fire engine, on the firſt attempt to work it. I was curious to ſee it, and ſeveral engines of different kinds in *London*, in order to find out the beſt method of fixing the work, as it was the firſt, and make improvements. But that model was on a different conſtruction from mine; that is a common fire engine, although the weight is on the ſame principle; but it, as well as Mr. *Clarke*'s imaginary invention, wanted two wheels, and a regulator of the ſteam in the inſide of the cylinder, to command the velocity, alſo two beams by way of ſpring poles, with ſmall rollers and ſtrong chains, as a further ſafety, on the neglect of feeding, *&c.* The explanation of the model will ſhew, that if any of theſe were left out all the wheels I uſed to make a circular motion would be of no manner of uſe.

21. By theſe, I was enabled to let the company that ſaw it work each time, ſee it work at leaſt a quarter of an hour, without any thing between the rollers.

22. But further to ſatisfy any who may have been impoſed on, to believe that I took my invention from theſe models, I refer them to Mr. *William Snell*, merchant, in *Auſtin-Friars*, *London*, who knows that after being many years abroad, I came to *London*, in the year 1767, and delivered him a letter from Mr. *Robert Stewart*, of St. *Uſtatia*, letting him

know, that I was going to *London*, to get a fire engine mill brought into practice, that I invented in St. *Croix*, and that it would be of great conſequence to the *Weſt-Indies*, if it could be effected. Alſo ſome of the gentlemen of the houſe of Meſſ. *Allen*, *Marlar*, and Co. merchants, in *Ironmonger-Lane*, know, that after being abroad from the year 1754, I came to *London*, from St. *Croix*, in order to bring the fire engine mill into practice, in the year 1767.

23. I flatter myſelf that this will ſatisfy the gentlemen who have been impoſed on by Mr. *Clarke*, to think unfavourably of me and my invention, that his aſſertions are groundleſs. It is clear, from all the ſteps he has taken, that if he had any thing in view, it muſt be to diſtreſs me, by frequent diſappointments, to oblige me to leave the iſland, or in expectation of my death, as I am advanced in years, being in the 70th year of my age, and to have it in his power to uſe my invention under colour of his patent and law.

24. The machinery that applies the power of a fire engine to a ſugar mill, conſiſts only of four wheels of four feet diameter, a box with weights, two beams by way of ſpring poles, ſome chains, and two ſmall rollers, and is ſo ſimple, and little ſubject to accidents, that I, ſeveral years ago, publiſhed a propoſal, *viz.* That I would contract for the firſt five years, to pay all the expence of the repairs of the fire engine, and machinery, that applies the power of it to the ſugar mill, for five pounds a year, and now propoſe the ſame: In order to ſhew the reaſons why it is not in general uſe, I ſhall ſhew the trials made in each year.

25. I was unfortunate, in coming to the iſland, in the firſt year of a deſtructive drought, that continued three years; for after it was put up and

ready to work, there was not water or canes to work it any conſiderable time, to ſatisfy the publick. In one of the ſaid years, the eſtate made only 50 hogſheads of ſugar, in another 9, that formerly made 150 to 200; and, the machine not working, was made a handle of by Mr. *Clarke*, and his friends, to induce thoſe who did not know the reaſon, to believe it to be the fault of the machine. By my coming in ſo ſhort a time before crop, none but Mr. *Pinnock*, and one other gentleman, was willing to have it tried on their eſtate, that crop. When Mr. *Pinnock* propoſed it, I objected, that there was not a certainty of water conſtant; to which he anſwered, that he would contract, and did, that if the machine on trial appeared that it would do as much execution as a good cattle mill, he would pay me for it, ſhould the water not be ſufficient after; and ſuch trials were made, as ſatisfied Mr. *Pinnock*, and every Planter and Overſeer, who were many, that ſaw it work, that it muſt anſwer, when it could be ſupplied with water and canes; but although it was computed not to conſume more than three puncheons in twenty-four hours, the ciſtern to cool the water could not be filled; Mr. *Pinnock*, then, agreeable to his contract, gave me an order, to receive near the value he was to pay for it in *London*; that aſſiſted me to bring iron materials for two other mills, which I was encouraged to, by gentlemen who propoſed to purchaſe them.

26. Mr. *Pinnock* being further ſatisfied, by ſeveral other trials of it, in crop 1771, before crop 1772, ordered new wheels of hard timber to be made, to replace oak wheels that were made in *England*, which were damaged by the weather; and after many trials of it in that crop, ſettled with me, and paid me the balance, and had it worked often

after by his own negroes; but if his overſeers had been to receive a thouſand pounds each, of three of them ſucceſſively, to damn it, they could not labour it more than they did, by depriving it of fuel and water, to prevent its working, to ſatisfy the publick, and reporting, that it would not do, although every gentleman and overſeer in the neighbourhood, and many more that came to ſee it, were ſatisfied that it would; particularly Mr. *Charles M'Kelt*, the mill-wright, who attended all the trials of it, and made the wheels, that he would undertake the work of one or more of them, and would contract, that he would make no demand of payment until it was tried, and found to anſwer the deſign, which was publiſhed in the St. *Jago* Intelligencer, of *March* the 9th, 1771, one of which papers I can produce; but all the overſeers were induſtrious in telling people who came to ſee it, that Mr. *Clarke* was making one that would do.

27. After a good many trials as before, and there was no water to work it any more, Mr. *Pinnock* went to St. *Ann*'s, to his eſtates there, but gave orders to the overſeer, to cauſe ſome trenches to be made, to collect rain water; I only deſired half a ſcore of negroes for one day, to do it, but he abſolutely refuſed; and ſoon after ſome gentlemen came from *Kingſton*, expecting to ſee it work, and while they were at the works, a heavy rain fell, that continued a conſiderable time, which would have filled the pond, had the trenches been made, that would be ſufficient to ſupply the machine to take off the remainder of the crop, and ſatisfy the publick; for after it was over, a great quantity run down the yard towards the works, that would have filled the ciſtern that cools the water, and ſupply the machine ſeveral weeks, that would, in ſome meaſure, have ſatisfied the publick, and diſpatch the

crop. But although the gentlemen and I urged the overſeer to allow ſome of the negroes to turn it, he abſolutely refuſed, notwithſtanding there was no water on the eſtate for the cattle ſtill houſe or coppers, but what was drawn out of a well 160 feet deep; and when he was aſked his reaſon why he would not, he replied, that he would not ſpoil the road for the wains. I have certificates of this from two of the ſaid gentlemen to ſhew, who are well known in *Kingſton.*

28. I let Mr. *Pinnock* know this on his return, he reprimanded him ſeverely, and ſoon after diſcharged him; but no more rain fell during the crop: This was crop 1769.

29. In the time the firſt trials were making, a braſs clack that hung plumb on the ſide of the cylinder, that opened and ſhut, to let the air out of the cylinder, and to keep it out, when the ſteam is condenced, to make the vacuum, was found broke, in a morning, after working the night before, although it had no force in working, that could break it, had it been glaſs of the ſame ſubſtance; that ſhewed it was broke by deſign.

30. In the time the ſaid firſt trials were making, I inſtructed Mr. *Pinnock*'s negroes to work the machine, and went to *London*, as before, after leaving it in a condition to work; and I am confident, it would have taken off the crop 1770, had it not been damaged; but when I went to *London*, and found that Mr. *Clarke* had got a patent, I wrote to Mr. *Pinnock*, that the only doubt I had of the machine taking off the enſuing crop was, that Mr. *Clarke* had got a patent, for a counterfeit of my invention, and he muſt have ſwore it to be his invention; that a man who would attempt to take away my right by ſuch means, I preſumed would not ſtop at any thing, to come at his end;

that no other could have any intereſt in procuring ſo wicked an action to be done, as the clack to be broke, that he had negroes very capable of getting it done; although he was in *London*; and it was the opinion of many, as well as my own, that nothing but a promiſe of a great reward, if my invention ſhould be damned, and Mr. *Clarke*'s ſcheme ſucceed, could have influenced his overſeer, to injure him as well as me, and to act ſo contrary to his intereſt and orders, about the water, *&c.* According to my fears, a little time before crop, a large braſs cock called the injection cock, that was joined to a large lead pipe, was cut off, and ſtolen; that was the moſt difficult thing about the machine to be repaired, without a perſon of underſtanding in fire engines. This was found out to be done by a negroe of Mr. *Pinnock*'s, that was a head boiler, by a ſaw that appeared to have cut lead, found in his houſe, who run off; and although conſiderable rewards were publiſhed, at ſundry times, for taking him, he has not been heard of; it was generally believed, he was ſent off the iſland, by thoſe who employed him to do it, to prevent a diſcovery. This prevented the working it the year 1770.

31. The drought continuing, the next crop produced only nine hogſheads of ſugar. The next overſeer, by order of Mr. *Pinnock*, made ſome trenches, to collect rain water, by which water might have been ſaved, to grind much more canes, notwithſtanding the drought, and ſupply other uſes of the plantation, and cattle that were drove a conſiderable way for water, for the well was dry, could I have prevailed on the overſeer, to order a few ſtones to be got to make a dam, to turn the water to the pond; but although I often urged it, and the crop before, he was obliged to bring water ſeveral miles, to ſupply the ſtill houſe, and cool the

coppers, and there was none on the eſtate for any uſe, until a heavy ſhower fell, that would have given a ſufficient ſupply, to take off the crop by the mill, and every other uſe, had a dam been made; but there would not any have been ſaved, for any uſe that crop, were it not that I was accidentally going from *Kingſton* to the eſtate, and by driving hard in the rain, came near the end of the ſhower, and got a couple of negroes to lay ſome dirt and pengwins, where a dam ſhould have been made, and by it a ſmall part was ſaved, that enabled me to make the trial, that was atteſted by Mr. *Pinnock*, *William James Hall*, Eſq; Major *Crane*, and many overſeers, and others, publiſhed in the St. *Jago* Intelligencer, of *March* the 9th, 1771, beforementioned, and ſeveral other trials; but although the overſeer was in the houſe all the time of the rain, he did not ſend a negroe to ſave the water; he made many trifling pretences after this, to avoid allowing fuel and negroes to work it, although he was working the cattle in the mill, until two of his acquaintance, one an overſeer, the other had been one, came to the works, and ſtaid a night. I made known to one of them the part he was acting, and requeſted they would endeavour to prevail on him to let them ſee it work, and it was greatly applauded by them; I got a certificate drawn of their approbation, which they ſigned; and as he had acknowledged that he believed it would do, they prevailed on him, after ſome heſitation, to ſign it alſo, which was publiſhed; yet, notwithſtanding, he continued to report it would not do; but Mr. *Clarke*'s would, and ſtill made trifling pretences to avoid its working any more; and on my urging his reaſon for not letting it work, he damned himſelf, if he would not leave the eſtate before he would let it work; on letting Mr. *Pinnock* terials; but the maſon, who undertook the ſtone work, retracted his agreement; he told me, among other excuſes he made for it, that he found Sir *Charles's* overſeers were againſt it; and that, I believe, was the chief reaſon; and ſo much time being loſt by this diſappointment, I could not get another to do the work, and find materials, in time, to get the machine compleated before the next crop: That was 1773.

54. No ſooner I made it known to Sir *Charles*, and told him, I ſhould be obliged to drop the work, than he gave immediate and peremptory orders to the overſeers of four large eſtates that lie together, *viz. Roſe-Hall*, *Burton*'s, *New Works*, and *Wallan*'s, to ſupply every diſappointment to carry on the work; but notwithſtanding I went a ſhort time before, with a letter wrote by Sir *Charles's* clerk, to fix on one of the eſtates I ſhould think moſt convenient, and although the overſeers were pleaſed with it, and acknowledged the eſtimate of the benefits to Sir *Charles*, by keeping breeding cattle in place of ſteers, that was publiſhed to be juſt, and that the breeding cattle would be as good to make dung, or better; alſo, that it would be great eaſe to themſelves, as the grinding canes with cattle is the greateſt care and trouble overſeers have, in crop time: Alſo, that the eſtimate of the coſt of the mill was ſmall, and the work of the eſtates would be little detriment; but when I went again, I found they had been influenced, by ſome means, to be as much againſt it as Mr. *Pinnock*'s overſeers, and had remonſtrated againſt it to Sir *Charles*.

55. This was a ſhort time after Sir *Charles* came to the poſſeſſion of his eſtates, by the death of his father; and in his father's time, he gave little attention to them, he relied on a gentleman, who did

ſome buſineſs for his father, particularly in recommending overſeers.

56. It was unfortunate for me, that this gentleman happened to be one of thoſe, who were impoſed on, to believe Mr. *Clarke*'s report of me, and my machine being complexed, and that he had invented one more ſimple, that would be more uſeful, and this gentleman was very active, in oppoſing my petitions in the aſſembly, which, being known to the overſeers, they retracted their former declaration, and confirmed every falſe ſtory contrived by Mr. *Pinnock*'s overſeers, in magnifying every thing that was done by the eſtates ten-fold, to pleaſe the ſaid gentleman; and it may be preſumed, they alſo had a promiſe of a great reward, if myinvention was damned, and Mr. *Clarke*'s took place. The ſaid overſeers impoſed on the ſaid gentleman, to believe that Sir *Charles* would looſe 2000*l.* in the crops of his eſtates, by the aſſiſtance given, and I am ſatisfied, the ſaid gentleman believed it; for he told me publickly in the coffee-houſe, in *Kingſton*, in the hearing of a great many gentlemen, that I was ruining Sir *Charles*'s eſtates; and I have reaſon to believe he told Sir *Charles* the ſame; for Sir *Charles*, about that time, told me, he was credibly informed ſo, and that he believed it, and appeared to be diſpleaſed, until I told him the abſurdity of it, and after waited on him with an account of the work done, by the eſtates; by which it appeared, that it was only the drawing ſtones, lime and ſand, for a houſe of 43 feet long, 20 feet high, part of it, and 16 the other part of it, and 13 feet wide, and one partition wall, that bears the laver, no gables drawing the timber, and about ſix wain loads of iron materials, and other things imported, 21 miles, which in the whole did not amount to more than ſix months work of a ſingle negroe to each eſtate, and was little more than one day's work of each ſteer on

the four eſtates; alſo each eſtate found 40 hogſheads of lime, and the whole expence of the ſaid machine, by an eſtimate delivered Sir *Charles*, including the ſaid work, did not exceed one thouſand pounds, including the ſaid work.

57. But this abſurd ſtory, and many others, was ſo induſtriouſly propagated by Sir *Charles*'s and Mr. *Pinnock*'s overſeers, that they brought the greater part of the overſeers in the iſland into the belief of it, and they alſo aſſerted it for truth, and the ſaid gentleman being told ſo, by great numbers of them, I am confident, he was of opinion that he was doing ſervice to the publick, in warning all planters againſt uſing them; for I was very well informed, that he was very induſtrious in aſſerting thoſe reports in the coffee-houſe, where it it was a ſubject of diſcourſe a long time; and being aſſerted by a gentleman of fortune, and undoubted veracity, who was believed to be well acquainted with Sir *Charles*'s eſtates, and is an attorney for many eſtates, it was believed by moſt people, and by many of my friends; but Sir *Charles* deſired me to give him a plan, and deſcription of the machine, to peruſe; and when I waited on him again, he appeared to me to underſtand the principles of it as well as I did; he was pleaſed to ſay, he ſtudied the mechanical powers at the college, and was fully ſatisfied it would anſwer the deſign; he then wrote a letter to the overſeers, with his own hand, to let them know he was determined to have it tried the next crop, if it was poſſible, that was 1773, and ordered them to give every aſſiſtance neceſſary, and not give him any further trouble about it; but when I went to the eſtates again, with the ſaid letter, the overſeer on *Burton*'s (that is the eſtate the mill is on) abſolutely refuſed to obey it, and ſaid, he did not care, if Sir *Charles* diſcharged him; the ſaid gentleman recom-

mended him, to his father, and had told him, if he ſhould be diſcharged, he ſhould not want a birth; I did not tell Sir *Charles* this at the time, but let a friend of the overſeers know it, who adviſed him to comply, or he might expect to be diſcharged, and the ſaid gentleman might not give him ſo good a birth, and for a ſhort time he was compliable.

58. By the delay and diſappointments given by thoſe men, and by ſome tradeſmen, as ill-diſpoſed towards it, Sir *Charles* was deprived of getting the benefit of the machine, in crop 1773; but he ordered ſome canes to be kept, to make trial of it, when it ſhould be ready; I found, if it had been ready in that crop, I was to meet every obſtruction in the overſeer's power, that I did on Mr. *Pinnock*'s eſtate, in 1772; for, in the beginning of the crop, the overſeer, expecting it would be ready in three or four weeks, uſed a very good ſtock of old houſe dried traſh to the great coppers, as well as the taich, while there was any, without any mixture of new, or allowing any to be dried on the yard, except one day, that Sir *Charles* was expected, and did come, a little was ſpread about the doors, to impoſe on him to believe I miſinformed him; for I told Sir *Charles*, he was following the ſame method Mr. *Pinnock*'s overſeer did, to deprive the engine of dry fuel, although the weather was very dry, and he, and every overſeer in the neighbourhood, always dried traſh on the yard, to ſave the old traſh for the taich, until the new traſh had time to dry in the houſe.

59. After I made ſome private trials of it, I ſent or ſpoke to each of the overſeers on the four eſtates, except Mr. *Chriſtey*, then overſeer of *New Works*, who was not at home; otherwiſe I believe he would have come, for he ſeveral times ſaw it work in private trials, and gave his opinion, that

it would anſwer, and always gave orders to aſſiſt the work when I deſired, but was often abroad; and when he was not at home, I had much difficulty to get any thing done by the negroes; and none of the reſt came. I learned afterwards, that they uſed their influence with other overſeers not to come; for ſome of them ſaw it work on the private trials, who gave their opinion, that it did as much execution as a water mill; they knew, that if it was tried publickly, it muſt be publickly known; and the falſe ſtory, they had impoſed on the ſaid gentleman, muſt be detected, ſhould it be certified by many overſeers; for at this time the aſſembly was ſitting.

60. I let Sir *Charles* know this, and requeſted, that he would be pleaſed to lay his commands on his overſeers to come and ſee it work, and report to him, if they had any objection, to ſay what it was; but Sir *Charles* replied, that he would not, for they would not make a true report; but he would deſire *George Aſhley Reid*, Eſq; and Mr. *George Forbes*, to attend a trial of it; accordingly they attended a publick trial of it, the 10th of *November*, 1773, and made a report that was unanimouſly agreed to; when the overſeers of *Burton*'s and *Wallan*'s, who did not come before, attended, and owned, that they were ſatisfied it would do; and they, and others, chiefly overſeers, in all twenty, beſides Mr. *Reid*, and Mr. *Forbes*, unanimouſly agreed to a man, and ſigned a report, that was publiſhed in the *Kingſton* Journal, of the 27th of *November*, 1773, that is now in my hands to be ſeen, and is, *viz.*

Burton's, *Tueſday*, *Nov.* 10, 1773.

" We whoſe names are under-written do certify, " that we this day attended the trial of Mr. *John* " *Stewart*'s fire engine mill, on *Burton*'s eſtate, in " ſixteen miles walk, belonging to the Hon. Sir " *Charles*

" *Charles Price*, Bart. for the ſpace of about three " quarters of an hour; and in our opinion, notwithſtanding the canes being old ſtanders, and " very dry, it required more force to grind them " than canes in proper ſeaſon; the newneſs of the " work, and negroes unexperienced to attend it, " did conſiderable execution, and made very few " ſtops; and if the machinery ſtands, which we " have no reaſon to doubt of, it will, in our opinion, anſwer the deſigns, as the rollers went four " times round in a minute, and ground the canes " very dry, without returning any."

61. This report, with a certificate of Mr. *Clement Hamilton*, a maſon, that worked for Sir *Charles*, and did the maſon's work of the machine, in crop 1774, he certified, *viz.* " I do certify, and " will make oath, if required, that I ſaw Mr. " *Stewart's* fire engine mill, on *Burton's* eſtate, at " work, in the preſent crop, and while I ſtaid, " which was about half an hour, it took in canes " as faſt as kept three negroe women very buſy " feeding it, and it would have taken in more, " and that it produced more liquor than I have " ſeen come from two cattle mills. *May* 14, 1774." This was publiſhed in the *Kingſton* Journal, of the 28th of *May*, 1774, which I have to ſhew alſo, and it is hoped will ſatisfy every unprejudiced perſon of the power of it, which muſt always be very near the ſame, as the power that works it is the atmoſphere; ſo that, if it appears to have leſs power at one time than another, it muſt be owing to an alteration in the wedging the rollers, which one of the boatſwains did ſundry times, with deſign to depreciate the machine.

62. Before crop 1774, Sir *Charles* parted with the overſeer, and employed another in his room, on the recommendation of the aforeſaid gentleman;

when Sir *Charles* let me know, I told him, ſince it was ſo, I gave over all hopes of being able to ſatisfy the publick; as I had often told him, I imputed all the oppoſition it met with was owing to his overſeer's deſire to pleaſe that gentleman, and ſerve Mr. *Clarke*; but Sir *Charles* replied, that he had aſſurance, or good reaſon to believe, he would give me all the aſſiſtance I required, which, I preſume, he had promiſed to him, and that the ſaid gentleman promiſed for him; for he was extremely obliging before crop begun, in getting ſome things I wanted done, which I made known to Sir *Charles*, and that I had hopes he would continue ſo.

63. When crop was begun, there was a very good ſtock of old traſh in the traſh-houſe, which I uſed to the fire engine, the firſt three days and two nights; in that time it worked ſo conſtant and well, that the overſeer allowed, it did exceſſive well; but he, as well as the former, and Mr. *Pinnock*'s overſeers, was determined it ſhould not be underſtood, that it would do as much execution as two cattle mills; for he kept one cattle mill working conſtant, and would not allow any more than one negroe to feed it, although he muſt ſee, that two could not ſupply it conſtant with canes.

64. After the firſt three days and two nights, a cill that was on a bad foundation ſunk, that ſtopped the working, which might have been repaired in a few days, but it, with a trifle more of work, was three weeks, before I could get the mill to work again; and in that time all the old traſh was conſumed, being uſed to the great coppers, as well as the taich; for he would not allow any new traſh to be dried, and the new traſh being put in the houſe, it had not time to dry; I urged then to have ſome dried on the yard, but, in twenty-four days and nights it worked, I could not get as

much dry traſh as would work it ſix hours, although I urged often the ſaving it would be of fuel, as the flame of it would boil the coppers, and ſave a ſeparate fire. I one day got ſome traſh dried, in order to let the overſeer ſee how it would boil the coppers, and cauſed the ſtoke hole of the great copper to be ſtopped for that end; but it was opened ſoon after, and the driver told me, he was ordered by the overſeer to do ſo, and not to ſuffer any ſuch trial. The only fuel I could get after was green wood, that is not good for coppers, and worſe for fire engines, although dry wood, that is, wood cut ſix or eight months is ſo good, that it is the fuel uſed in *France* to make glaſs, conſequently muſt be as good as coals; and the grate and fire room of the fire engine boiler being only about half as large as for a great copper fire, it would not contain near ſo much wood as a great copper fire; and the wood alſo, being wet in the heart, could not keep ſo conſtant a flame as traſh, which occaſioned the engine to ſtop often, for about a minute at a time, until the ſteam got more rarified in the boiler; but this was no detriment to its anſwering the deſign, that was to do as much as two cattle mills, if the overſeer would have allowed it to be fed conſtant; for after a little time working, that the work got hot, the rollers went five times round in a minute, and took in larger bundles than was uſual for the cattle mills; and the ſtops did not take up near ſo much time as the ſtops of a cattle mill; and as a cattle mill, worked with ſteers, does not go round more than once in a minute, it was evident, that it would do as much execution as four cattle mills, if it was conſtantly fed; yet notwithſtanding the overſeer made a handle of theſe ſtops, to ſay it would not do as much as two cattle mills, by the working conſtant, and not being fed conſtant, one of the ſpring poles gave way, that occaſioned a few hours ſtop, to ſplice it two ſundry times; and alſo ſome iron work, that occaſioned a few hours ſtop ſometimes, although both were of ſufficient ſtrength to laſt ſeveral crops, had the mill been fed conſtant.

65. The overſeer made a handle of thoſe ſtops, to report it would not do ſo much as two cattle mills, and that it was difficult to keep it in repair, and threatened to take the rollers from it, which belonged to one of the cattle mills: I urged, that he muſt know, that if he would ſtop the cattle mill, and allow it to be fed conſtant, only for one copper full, he would be ſatisfied of it, which he abſolutely refuſed. This confirmed me in what I clearly ſaw, by all his proceedings, that he was determined to damn the machine at all events. I then aſked him how he could work Sir *Charles's* ſteers, that would at the end of crop be ſeven or eight pounds the worſe each, when he muſt ſee the machine had ſufficient power to do more work than the two cattle mills; yet he ſtill refuſed to allow the trial to be made; but in the afternoon of that day, or next, he conſented, and ſtopped the cattle mill, and allowed a trial to be made of a copper full; and a ciſtern was filled to a nail, that was a mark to fill the coppers by, in leſs than an hour, that uſually took the two cattle mills an hour and a half, notwithſtanding the ſtops of the fire engine; yet, notwithſtanding, he diſputed, and ſaid it was not a copper full; and inſiſted, it would not do as much as two cattle mills; and ſaid, he had orders from Sir *Charles*, to take the rollers from it, if it did not do as much as two cattle mills, and would in a couple of days, if the orders were not coun-

termanded,

termanded, and kept the cattle mill working, and only one negroe feeding the machine.

66. I then waited on Sir *Charles*, and let him know of the trial that was made, &c. and the deſign of the overſeer to take the rollers down; on this he ordered his clerk to write to the overſeer, to ſtop the cattle mill, and try the machine another week, and to allow the negroes that worked it, to be entirely under my command, alſo to allow negroes to dry traſh on the yard for it, and two to feed it.

67. When I delivered this letter, the overſeer ſhewed great anger, and ſolemnly ſwore, he would do every thing in his power to prevent me of ever getting any benefit from my invention; and accordingly, when the machine began to work, he was ſo far from complying with the orders, that he had a negroe that was inſtructed to attend and keep it in repair, taken from the machine in my preſence, and whipped, telling him, he might blame me for it, for keeping him from going to other work after ſpell.

68. The night of the day before this, exactly at twelve o'clock ſpell, the cog wheel on the middle roller met with ſome damage, two cogs were broke, and the next night, exactly at the ſame time, the ſaid wheel was broke in ſuch a manner as rendered it uſeleſs.

69. On making it known to Sir *Charles*, that the wheel was broke, he was ſo generous, to order his mill-wright to repair the damage, and was pleaſed to ſay, that new machines were ſubject to accidents, but if it worked only one day, he was ſatisfied it might be made to work years, and were it not that his overſeers were ſo much againſt it, he would order more of them.

70. But the overſeer would not allow the ſawyers to get the timber, and when I waited on Sir *Charles* again, he told me, the overſeer told him, the works were going to deſtruction, for want of repairs, and the ſawyers, *&c.* could not be ſpared, but deſired I would get the mill repaired, and he would take care that juſtice ſhould be done it, the next crop, by which I underſtood he meant to diſcharge the overſeer, and he accordingly did.

71. Before next crop, Sir *Charles* reſolved on going to England, and appointed the gentleman before-mentioned his attorney, and Mr. *George Forbus* before-mentioned, who had been about ten years in Sir *Charles* and his father's employ as overſeer of *Lovides* eſtate, chief manager of all his eſtates, whom Sir *Charles* and I had reaſon to believe would be deſirous to give every aſſiſtance and indulgence, as he had made ſo favourable a report of it; but after I had, with great difficulty in my unhappy circumſtances, got a new wheel made, and two ſide rollers, Mr. *Forbus* told me, that he underſtood by the former overſeer, that the machine made ſo many ſtops, it would not do ſo much execution as two cattle mills, and that it conſumed more fuel than the eſtate could ſupply; alſo that it would be expenſive to keep it in repair, and he could not encourage the working it, leſt any diſappointment ſhould be in getting off the crop in time, but ſaid, that he would leave it to the preſent overſeer, who told me, when I deſired the aſſiſtance of two negroe carpenters, that I inſtructed to work and keep the machine in repair, that he had other work for them to build a houſe, and I need not depend on them; from which and many other circumſtances, I clearly ſaw, that it was reſolved it ſhould not work that crop, therefore I dropped thoughts of attempting to work it in crop 1775.

72. I flatter myſelf, Gentlemen, that the facts and proofs herein will ſatisfy you, that the informations you had of Mr. *Clarke* having invented a better machine than mine, that prevented you of uſing my invention, was groundleſs; and that you will ſee it for your intereſt to make uſe of them.

73 I have, in the Preface to this, given ſome advice concerning the building them; and I am, with much eſteem and acknowledgment of the obligation I am under to you, for the aſſiſtance you were pleaſed to give me to make the firſt trial of it,

Gentlemen,
Your moſt obedient and moſt humble Servant,
JOHN STEWART.

P. S. The loſs Sir *Charles* has ſuſtained, by the overſeers, *&c.* depriving him of the uſe of the machine on *Burton* eſtate, three years paſt, appears by the annexed eſtimate of the yearly benefits, that every planter may judge of; beſides preventing him of theſe benefits from three other eſtates, that join it, on each of which the ſame number of cattle that is 95 ſteers are kept to grind the canes only; for he was reſolved to erect a fire engine mill on each of them directly, had the overſeers allowed it to be tried at firſt, beſide other great benefits, that are mentioned in the ſaid eſtimate.

I flatter myſelf, that what Mr. *Clarke* did on Mr. *Chambers*'s eſtate, *&c.* as before, will convince Sir *Charles*'s attorney and manager, that if Mr. *Clarke* had any ſcheme, it has proved abortive, and that they will encourage my invention that is cheap; and every gentleman, as well as mill-wright, may ſee the ſimplicity of the application of the fire engine, by the annexed plan and deſcription, and judge of it; for the power and certainty of fire engines, it is preſumed, none will queſtion. Sir *Charles* has canes planted on an eſtate, called *Shanton-Pen*, and another, called the *Farm*; on theſe, works are now erecting; and beſide the annual benefits, which may be had in theſe eſtates by a fire engine mill on each, he may ſave, in the firſt coſt, in each, £.2884, as appears by the annexed eſtimate.

Another benefit he may have by fire engine mills, on thoſe two eſtates and one other, I learn, he has ordered to be ſettled on *Black River*, by a river that runs through each of them, that never wants water, but has no fall to turn wheels; the fire engines may raiſe water, to water the canes in each of them, at all times, when they are not grinding canes; the great benefit by watering canes is deſcribed in the annexed plan and deſcription of a ſliding rod, to raiſe water, at the diſtance of 400 yards from the fire engine, at an additional expence of about £.300 currency; and as the *Farm* and *Black River* lie in a part of the country ſubject to long droughts, the benefits will be the greater.

But the loſs to Sir *Charles* is inconſiderable to the loſs the iſland in general has ſuſtained; for it is computed that forty or fifty new cattle mill eſtates have been ſettled ſince I proved the firſt of them in *London*, and *Jamaica*, who probably would have had fire engine mills; beſides many others, who have cattle mills, would have had them, had they not been diſcouraged by the falſe reports of Mr. *Clarke*, and his influence on the overſeers, as before-mentioned, to depreſiate the firſt, and impoſe on the public to believe he had invented a better machine.

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An ESTIMATE of the ANNUAL BENEFITS that may be had, by keeping breeding cattle, in place of 95 ſteers, that Sir *Charles* always kept on each of four eſtates, that lie together, *viz.* *Roſe Hall*, *Burton's*, *New Works*, and *Wallan's*; to work the mills only; the benefits to thoſe who uſe mules are much more.

		£.	s.	d.
It is allowed, by experienced ſtock farmers, that the land that maintains 95 ſteers will maintain a ſtock ſufficient to produce cattle for ſale, yearly, *viz.* 20 ſteers, of three years old, worth 14*l.* each, and 20 heifers in calf, worth 9*l.* each, *Jamaica* currency, that is 140*l.* for 100*l.* ſterl. ——— ——— ———		460	0	0
That 95 ſteers, when four years old, and broke to work, is worth 16*l.* each - - -	£. 1520			
That the ſtock to breed with are worth - - - - - - -	£. 720			
Saved	£. 800			
The intereſt uſual on money in cattle is 10 *per Cent.* which on this ſum is - -		80	0	0
It is allowed, by experienced planters, that ſteers of four years old, worth 16*l.* each, on an average, after being worked ſix years, do not ſell for more than 6 or 7*l.* but ſuppoſe 7*l.* the loſs on each is 30 ſhillings yearly, that is - - -		142	10	0
Alſo, that two out of twenty die yearly, one year with another, by hard labour, accidents, &c. - - - - - - - -		152	0	0
		£. 834	10	0

	£.	s.	d.
Brought over	834	10	0

Moſt planters allow, that much more than two ſteers out of twenty die yearly, on an average, by hard labour, accidents, &c.

Beſide the above ſaving, the fire engine mill does not require ſo many negroes to attend it as two cattle mills, by 32, in 24 hours, which appears, *viz.* one cattle mill takes two cane carriers, one feeder, one returner, one baſket filler, two to carry away traſh, four to drive cattle, one to take care of cattle and catch them, one gutter cleaner, and one boatſwain, in all 14 in one ſpell, that is 28 in the day to two mills, and the like in the night, is 56, in 24 hours; but as one cattle catcher, and one boatſwain, ſupplies the two mills, each ſpell, deduct 4, and there remains 52.

A fire engine mill takes, *viz.* two cane carriers, two feeders, to do the work of two cattle mills (if more, it will require another feeder) one returner, one baſket filler, two to carry away traſh, one gutter cleaner, and one boatſwain; in all ten to one ſpell, that is 20 in 24 hours, which is 32 leſs than to two cattle mills; if three are allowed to feed the mill, and two ciſterns made to contain what liquor the mill produces faſter than the coppers take it, the mill may ſtand one half, or one third of the time, and the coppers be worked by fuel uſed under the great coppers; but allow that 16 of thoſe negroes that drive the cattle to be men-

	£.	s.	d.
Brought over	834	10	0
boys, ſome of them leſs, they will be as uſeful as eight able negroes, at leaſt to hand-weed young canes, which ſuffer moſt in crop time, theſe, with 16 able negroes, that is 24, will be ſaved all the time the mill works in crop, which is computed to go 90 days and nights, that is 2160 days work; that, in crop time, every eſtate, that is not very ſtrong in negroes, readily hire negroes at three bits *per* day, is, *Jamaica* currency, - - - - -	204	17	6
And as the fire engine mill has power to take the crop off in leſs time than two cattle mills, theſe negroes are of the more value, to ſupply the mill with canes, to diſpatch the crop, and thereby begin ſooner to hole and plant canes early, to get the benefit of the ſeaſons, by which a conſiderable increaſe of ſugar may be expected the enſuing crop, from the rattoons being cut early, as well as the plants planted early. - - - £.	1039	7	6

An Estimate of the ſaving in the firſt coſt, to thoſe who ſettle new eſtates, *viz.*

	£.	s.	d.
Two mill houſes, by Mr. *Wynter*'s eſtimate, 810*l.* each - - - - - -	1620	0	0
N. B. They always are made of hard timber, and 60 feet diameter in *Jamaica*, and ſhingled.			
Two ſetts of rollers and frames, 450*l.* each, is - - - - - - - - - - -	900	0	0

		£.	s.	d.
Brought over		2520	0	0
Mules to work the mills 36, at 30*l.* each, is - - - - - - - - - - -		1080	0	0
Forty-five ſteers, at 16*l.* each, is		720	0	0
		4320	0	0
The coſt of the fire engine mill, without any expence of labour from the eſtates, - - - - - - -	£.986 0 0			
One ſett of rollers and frame	£.450 0 0			
		1436	0	0
Saving		2884	0	0

A DESCRIPTION of a Reſervoir, to be made of Earth, at a ſmall Expence, that will hold Water as well as moſt Stone Ciſterns, that are grouted; with a Deſcription and Directions for making them, and the Expence of one, with Directions to collect Rain Water, to ſupply them, as practiſed in the *Eaſt-Indies*, and other Countries ſubject to long Droughts, by which every Plantation in the *Weſt-Indies* may always have Plenty of clean Water, in the longeſt Droughts, to ſupply Fire Engine Mills, and every other Uſe of Plantations.

Many plantations have ponds ſo large, that, when full, contain water ſufficient to ſupply the uſes of them twelve months, if they were a proper depth and ſtaunch, without any ſupply, yet, in a drought of two or three months, are quite dry.

This is uſually imputed to exhalation, and the water ſinking in the bottoms of the ponds; and to prevent it, ſome have taken a method, that could not fail to prevent it, that is, by laying a bed of clay in the bottom, and working it into mortar, by negroes feet, or cattle; ſome mix plantain leaves with it, that can be no detriment, although not neceſſary, nor is clay, unleſs the bottom is a gravel; when ſuch is met with, let clay be mixed with it, and dug ten or twelve inches deep, and worked into a puddle; it will not let any water of any conſequence through it, while it is kept wet; and if at any time it ſhould be dry, and crack, the cracks may be cloſed when wet again, by negroes tramping it, to fill the cracks.

But although the bottoms are made ſtaunch, few of them hold water in a drought of any long continuance; from which ſome argue, that it is owing to the nature of the ground in the *Weſt-Indies*, and that it is not poſſible to make them ſtaunch; but it is evident, that it is owing, chiefly, to the water finding a way through the ſides of the pond, between the ſurface of the ground and the bottom; for all ground is poreous, and has cavities, ſome more and ſome leſs, which appears by digging a hole in any ground; for the earth taken out, being put in again, if it is tramped, or rammed, to make it cloſe or ſolid, it will not fill the hole by one-fourth part. Now to make the ſides ſtaunch, after the bottom is made ſo, dig the ſides of old ponds all round, four or five feet back, nine or ten inches lower than the bottom, as high as the ſurface of the ground, and lay it in again, by way of lining, tramping or ramming it, to make it ſolid; and if this is done, none of any conſequence can be waſted through the ſides. This is proved to a demonſtration; for it is found by experience, that banks (that have been made of earth, dug out of the ground, to make ponds, and laid on the ſurface of the ground, the banks made of it, five or ſix feet higher than the ſurface of the ground, as moſt are in the low ſide) when full, do not uſually let any water through, if they did, it would be ſeen; when the water is let out of ſuch banks, it is obſerved, that it does not penetrate, ſo as to wet the earth twelve inches, although ſuch earth is laid out promiſcuouſly, and not rammed; conſequently the lining that is carefully tramped, or rammed, muſt be ſtaunch.

Now, if this is carefully done, and ſome ſmall trenches made, to collect rain water, as deſcribed in the annexed plan, every heavy ſhower will produce ſome to ſupply the waſte by exhalation; which, by computation, will not exceed one inch in a week, that will only be about 20 inches in depth of the reſervoir, in a crop, and one day of heavy rain may fill the ciſtern full.

The water uſed daily in a plantation, in crop time, is computed, *viz.* to mix liquor and cool coppers, three puncheons; to the cattle and other uſes, four; and to the fire engine, three; in all ten: The ſuperfluous water raiſed to ſupply the engine, by the engine pump, runs into the worm tubs, and the hot water from them, with the hot water from the fire engine, to the pond or cooler, and ſupplies again.

A reſervoir of the dimenſions of the annexed plan, that is, 60 feet ſquare, and 8 feet deep of water, will contain 1150 puncheons, at 112 gallons each; and, at 10 puncheons a day, will ſupply 115 days; and, as crops in eſtates that are not very wet uſually continue about four months, and, in that time, does not work more than 90 days, excluſive of Sundays, and ſtops to weed canes, there can be no reaſon to doubt of ſuch reſervoir being ſufficient.

A Deſcription of the aforeſaid Plan of a Reſervoir, with Directions, for making them, and to collect Rain Water, to ſupply them, viz.

(A) The reſervoir, to be 60 feet ſquare, will be moſt convenient, to be made at, or near the foot of an hill, or ſome riſing ground, to collect the water that is to be let into it, by a wooden gutter, (B) of two feet and an half wide, or ſo wide as to let all the water, collected in a heavy rain, run into it, over the top of the bank into the trunk (C) that is to ſtand upright, on a plank or ſtone work, to receive the fall of the water, and prevent the ground from pooling; ſuppoſe the ground the reſervoir is made on to be level, although if on a deſcent, it makes little difference, but on a level, it is to be dug four feet deep; and if on a deſcent, the bottom is to be level alſo; the earth taken out will make the bank five feet high, in all nine feet deep; that will contain at leaſt eight feet depth of water; part of one ſide of the gutter at (D) to be made ſo low, that, when the reſervoir is full, the ſuperfluous water will run over; that will prevent the banks being overflowed, and ſave much trouble of cleaning the dirt out of it, that is uſual; for when the water, as in moſt ponds, runs through, the ponds in three or four years are partly filled with mud, and contain little water.

(E E) A drain of three feet wide, and one deep, to be made aſcending; the riſing ground to receive rain water, that will be collected by the trenches (FFFFFF) that may be only 16 inches wide, and 8 deep; the earth taken out to be laid on the under ſide; thoſe to be made ſlanting, along the ſide of the riſing ground, like terrace walks, at convenient diſtances.

(G) A trench to be dug in the ground, as deep as the bottom of the reſervoir, with a pipe of caſt iron, lead, or wood, and a cock, (H) to let the water out, to ſupply ciſterns, for the uſe of plantations and cattle.

Where it is not convenient to have thoſe reſervoirs near the works, they may be at one hundred yards, or any diſtance, if convenient, for the hot water from the hot ciſtern of the fire engine to run to the reſervoir to cool; if the top of the bank is not higher than the top of the great copper, it will have a ſufficient deſcent.

Directions for making the ſaid Reſervoir.

Obſerve firſt, to dig a trench of five feet wide, and five deep, all round, in the outſide of the clear of ſixty feet ſquare; then let a bank be made in place of it, by way of a lining, as before, that may ſlope to two feet thick at top; while the earth is laying to make the upper bank, let it be ſpread often, and the negroes feet that carries it, or wheelbarrows (which will be leſs expence to remove the earth than baſkets) will be ſufficient to make it ſolid, and hold water, unleſs it ſhould be a coarſe gravel; when this happens, a method muſt be taken that is practiſed in ſome banks in the Duke of *Bridgewater*'s Navigation, by making a puddle wall, *viz.*

When the bank is making to line the reſervoir, dig a trench of two feet wide, and twelve inches lower than the bottom, until it is near full of water; put earth of any ſort, except coarſe gravel, into it, to make it into a puddle; mix it well with hoes or ſpades, breaking all the lumps, about a perch or two at a time all round; then begin the lining, that is to be five feet broad at bottom, leaving two feet of it between the earth you lay and the bank, for another puddle of twelve inches deep, and ſo on, until it riſe as high as the ſurface of the ground; you need not wait longer to make another puddle, than the firſt puddle hardens; the Duke of *Bridgewater*'s engineers, before they found out this method, made walls of wrought clay, which took a great deal of labour, and did not anſwer ſo well. I have proved this method at Mr. *Pinnock*'s fire engine mill, in a reſervoir I had made to cool the injection water, of twelve feet wide, and twenty-four feet long; it was dug ſix feet deep, in very looſe gravel; and although the puddle, in place of earth tramped or rammed, as before, which is ſufficient of itſelf to hold water, was incloſed only by ſome boards laid in looſe, without being jointed, ſupported by ſome ſtanchens ſet up in the bottom, to confine the puddle, and ſome clay mixed with the gravel in the bottom, worked by negroes feet, I found it as ſtaunch as any ſtone and lime tank, or ciſtern that is grouted.

An Eſtimate of the Expence of making a Reſervoir of 60 Feet ſquare, to hold 8 *Feet in Depth of Water.*

	£.	*s.*	*d.*
The digging 60 feet ſquare, and 4 feet deep, amounts to 14400 cube feet, and, allowing ſix negroes to dig and remove 200 feet in a day, will take 72 days, at 3 bits *per* day allowance, or 12*s.* 6*d.* *per* day, amounts to - - - - - - - - -	45	0	0

This ſome jobbers have propoſed to do it for, and it is preſumed may make good profit by it.

	£.	s.	d.
Brought over	45	0	0
In one of 70 feet ſquare, will be 19600 cube feet, will take 98 days of ſix negroes, at 12*s.* 6*d.* *per* day, will coſt - - and will contain 1560 puncheons.	61	5	0
In one of 80 feet ſquare, will be 25600 cube feet, which will take 128 days of ſix negroes, at 12*s.* 6*d.* *per* day, will coſt	80	0	0

This will contain 2052 puncheons, that would, if full, ſupply any plantation one year, ſhould there not be any rain in the time.

Many have been at ſeveral hundred pounds expence to ſink wells, and have not met water, and thoſe who have, frequently find it impregnated with minerals in the earth it lies in, that gives it a diſagreeable taſte, and ſome is found unwholeſome to drink, and not good to waſh with; for which reaſon, ſome who have draw-wells ſend ſeveral miles for all the water uſed to drink; whereas, rain water is allowed to be the pureſt, and beſt for every uſe.

An objection may be made, that water kept in a reſervoir or pond is not fit to drink, and is often muddy, and not fit to waſh with, eſpecially as it will always be muddy after rain; but to remedy this, an artificial ſpring may be made, to be ſupported by water from the reſervoir, *viz.*

When the reſervoir is making, let a trench be made, to communicate with the reſervoir, about five feet wide, and twenty in length, from the bank of the reſervoir; leave a ſpace in the bank about 18 inches wide from the bottom to the top of the bank, which fill with ſmall ſtones and gravel, for the water to come through to the trench, and fill the trench on the outſide with river ſand and gravel, as high as the ſurface of the water in the pond, when full; a bank is to be made on each ſide of it, above the ſurface of the ground, to confine the gravel; and at the end of the trench a well is to be made, to receive the water, that will be filtered through the ſand and gravel; and as no cattle can get into the reſervoir to foul it, the water will always be as pure, and clear as ſpring water, and will always ſupply for waſhing as well as drinking.

The well is to be circular, about three feet diameter, and three feet deeper than the bottom of the reſervoir, built with ſtone or brick, but no lime, as it would give the water a diſagreeable taſte; a wall may be built with either; if moſs can be had, it would be beſt to lay the ſtones or bricks in, it is uſually done ſo in *Europe*, being cleaneſt, for it keeps dirt from falling from behind the ſtones.

The wall above the ſurface of the water may be made with ſtone and lime, and ſhould have a frame of wood on it.

I have had experience of water from a river, that was often muddy, being filtered in the way above-mentioned.

In many eſtates, the ground is ſo rocky about the works, that four feet depth of earth cannot be had to dig, to make ſuch reſervoir; where this happens, they muſt be made on the ſurface of the ground, with the banks made of earth, brought by carts or wains; they may not be made ſo deep, but muſt be wider in proportion; a bank of ſeven feet, to hold ſix feet of water, will be ſufficient; but as reſervoirs may ſtand at any diſtance from the works, as before, there are few eſtates, that ſome convenient place may not be had to dig four feet deep in.

A Deſcription of Plan A, *being a Fire Engine, and the Application of it to a Sugar Mill*, viz.

A A The lever, it moves on a center on the partition wall in the houſe.

B B The cylinder.

D Two ſtrong chains that ſuſtain the piſton (1) that works up and down in the cylinder.

E The fire place and grate.

F F The boiler, the under part is the water in it, the upper part is a reſervoir for ſteam; the flame from the boiler goes through a paſſage that appears in the Plan, and the boiler of the engine, being ſet cloſe to the wall of the boiling houſe, and the great copper cloſe to the wall, the flame boils the firſt and ſecond coppers.

G The ſteam pipe, that lets the ſteam out of the boiler into the cylinder.

H H The plug frame, it is worked up and down by the lever, and moves the rod (10) that opens the cock (9) and injects cold water that condenſes the ſteam in the cylinder, and makes a vacuum. This ſhews the power of the atmoſphere, that is, the power which works the fire engine, for when the vacuum is made, the atmoſphere preſſes on a piſton of only 30 inches diameter, with a force equal to ſix thouſand pounds weight and upwards, in working engines; but the real preſſure of it on that ſurface is proved, by the air-pump, to be 14 pounds on every ſuperficial ſquare inch, that is near double.

The piſton, being forced down by the atmoſphere, lifts the box (X) that contains weights to half the power, and works one of the rack wheels in plan (B) and on the return of the box, the weights in it work the other wheel alternately.

The plug frame alſo moves the rod (6) alternately, which opens a plate of braſs that is in the inſide of the boiler, called a regulator, and keeps the ſteam out, until the vacuum is made, and the inſtant the piſton has made the ſtroke down, it opens and lets the ſteam into the cylinder, that ſupplies the place of air, and balances the atmoſphere, and the box going down, works the other wheel. The regulator is alſo opened by the plug frame moving the rod (6).

II A leaden pipe, that conveys water from the ciſtern K, to condence the ſteam.

P Another leaden pipe, that conveys cold water to the cylinder, to keep the packing of the piſton moiſt, and keep out the air, (17) is a cock in it.

QQQ A pump and ſtand pipe, that forces water up to the ciſtern K, that ſupplies the ciſtern, ſtill-houſe, and boiling-houſe, by turning a cock, without the labour of pumping.

R R A beam, called a working beam, that ſtands in place of a pump rod in fire engines, which raiſes water.

S Is a ſideview of two wheels, that is fixed, one on each ſide of the ſaid beam, they are called rack wheels, that is deſcribed by Plan B, each of them has a caſe made of planks, with a hole in the middle, that fits the ſhafts, and they being looſe, move backwards and forwards on the ſhafts, alternately, half the circle. They bring back the palls (11) (11); on every ſtroke of the engine alternately, by the ſmall chains (12) (12) to fall into the teeth of the rack wheels; there is a ſpring on each ſide of each of the ſaid caſes, that by a ſtrap of iron, or a piece of wood that lies on the pall, to keep it cloſe to the teeth; the Plan ſhews how, by two ſtrong chains, one end of each being bolted to the looſe wheels and the other ends to the plug frame, it works the rack wheels.

T A ſide view of 2 cog wheels on the ſame ſhafts the rack wheels are on, only 4 feet diameter each, which alternately moves another cog wheel (U) of 4 feet diameter alſo, that ſtands in place of the arms of a windmill, or a water wheel; and the nut (13) being on the ſame ſhaft, moves the cog wheel on the middle roller of the ſugar mill W; the ſame as in a wind-mill or a water-mill.

Y Y Two beams about 9 inches ſquare, each, uſed as ſpring poles, 20 feet long; 12 feet of each is allowed for the ſpring end, they are laid one in each ſide of the box, as low as it goes down; to each of theſe is a ſtrong chain, one end of each bolted to the ends of the beams, the other end bolted to the upper edge of the box, which is ſupported by chains bolted to the working beam R R, when the box goes up, and the bottom of the box is ſuſtained by a croſs of iron, very ſtrong, that a ſquare bar of iron goes through, and a key. Thoſe chains are fitted ſo, that the piſton cannot ſtrike on the bottom of the cylinder in caſe of neglect of feeding.

(13) Is a roller on each ſide of the box for the chains to come over, which is fixed at a proper height, to prevent the box from coming further down than is proper in caſe of neglect of feeding.

Explanation of Plan E, *ſhewing a Method of raiſing Water by the Fire Engine, at* 400 *Yards Diſtance, or upwards.*

A A Is a ſliding rod, borne by two pieces of timber, each at ten or twelve feet diſtance, ſuch as (B) repreſents, (C) is a roller, about 3 inches diameter, and may be 12 or 16 inches long, with a ſmall gudgeon in each end, for the rod to move eaſy on, and a piece of timber (D) under it, that is let through the poſts in a long mortice in each, to raiſe or lower the rollers to bring them to a proper heighth.

E E E Are three wheels, or may be levers, with chains.

F F A wood gutter, that may be made of pitch pine, with a coat of tar and oaker, and may be borne by the ſame poſts, to bring the water to the works, or may be borne on other poſts or pillars of ſtone or brick, to any higher ground that may be convenient to water cane pieces.

G G G A pump and ſtand pipe, that will deliver the water into the wood gutter F F, or by ſtopping that pipe will raiſe it to H, or any heighth neceſſary, ſhould it be 50 feet or upwards.

The ſliding rod, gutter, pump, &c. may be had and fixed, to bring the water 400 yards, that is computed is the diſtance from the place the works are fixing on Sir *Charles*'s eſtate, called the *Farm*, to the river, for about 300*l*. additional expence to the eſtate, excluſive of the Fire Engine Mill.

Plan D *is an Explanation of a Regulator of the Steam*, viz.

The uſual diameter of ſteam pipes is one inch for every ſix inches of the cylinder, that is five ſuperficial inches for a cylinder of 30 inches, this makes ſixteen ſuperficial inches of a paſſage for the ſteam. The regulator I uſe is a plate of iron, that covers the ſteam pipe in the cylinder, with a hole in it, of two inches by two and a half, and a cover, that ſlides to cover it leſs or more, to leſſen or inlarge the paſſage, that leſſens or increaſes the velocity of the piſton to any degree; for the ſteam going in by degrees, the preſſure of the atmoſphere is leſſened by degrees, and the paſſage for the injection water is proportioned accordingly. I find, that by covering the ſaid hole, all but one inch and an half, that is, leaving the paſſage for the ſteam only three ſuperficial inches, is a proper proportion in moderate work; but if it is neceſſary to do more work than two cattle mills, the paſſage may be half an inch more; if the paſſage is any more, it will let the ſteam in ſo faſt that it will not command the atmoſphere, ſo that the piſton will riſe too quick, and when the mill is neglected to be fed, the box will go down with more velocity than will be convenient. The plate of iron is faſtened to the ſteam pipe by the ſtraps in each ſide of it, as by the Plan, they are turned down to lie cloſe to the pipe, and are to have a key to go through them, a hole is made in the ſteam pipe in each ſide to receive a bolt about half an inch ſquare, that by the keys in the ſtraps keeps the plate down.

Explanation of Plan C, *being the Application of a Fire Engine to work Saws.*

A Is the working beam R R, in the fire engine, in Plan A.

B B The rack wheels in the ſame.

C C The cog wheels in the ſame, that are on the ſame ſhafts, that alternately work the wheel D.

There are three frames on the crank the ſaws are on, which work 49 ſaws, and a fire engine mill may work the ſame, or more if there ſhould be occaſion; but as it may work night and day, without loſs of time, I am of opinion, that thirty ſtrokes in a minute will do twice as much work as the ſaid windmill; but if it ſhould not be found ſufficient, the wheel E may be added to it, on a ſeparate ſhaft, as the Plan ſhews; and if it is made three feet diameter, the ſaws will ſtrike 45 ſtrokes in a minute: It may be alledged this would leſſen the power, but I have reaſon to believe, that a cylinder of 30 inches diameter will be ſufficient to overcome a much greater power. The Saw Mill in *London*, in 12 ſtrokes cuts 1 inch, and allowing the depth of the carf to be 12 inches, each ſaw will cut 12 feet and an half in an hour, which will be 288 feet in 24 hours, ſo that 49 ſaws may cut 14,112 feet in 24 hours, including ſome time loſt by ſharping the ſaws, &c. provided it worked night and day, which the Fire Engine Mill may conveniently do.

I examined the windmill to ſaw timber in *London*, and ſeen it work, and obſerved, that in a middling breeze the ſaws ſtrike about 30 ſtrokes in a minute, although in a very ſtrong breeze they ſtrike ſixty; but in ſmall breezes I preſume only from fifteen to twenty; and the working is uncertain, as it depends on the wind, and many days and nights it cannot work any.

The fire engine makes fifteen ſtrokes in a minute, and moves each of the cog wheels half the circle, as often, and they being four feet diameter move the wheel D, that is only two feet diameter, thirty times, ſo that if thirty ſtrokes in a minute are allowed to be ſufficient for the ſaws, the crank may be worked by the ſaid wheel D.

G G The crank the frames are to be fixed on, that the ſaws are ſet in.

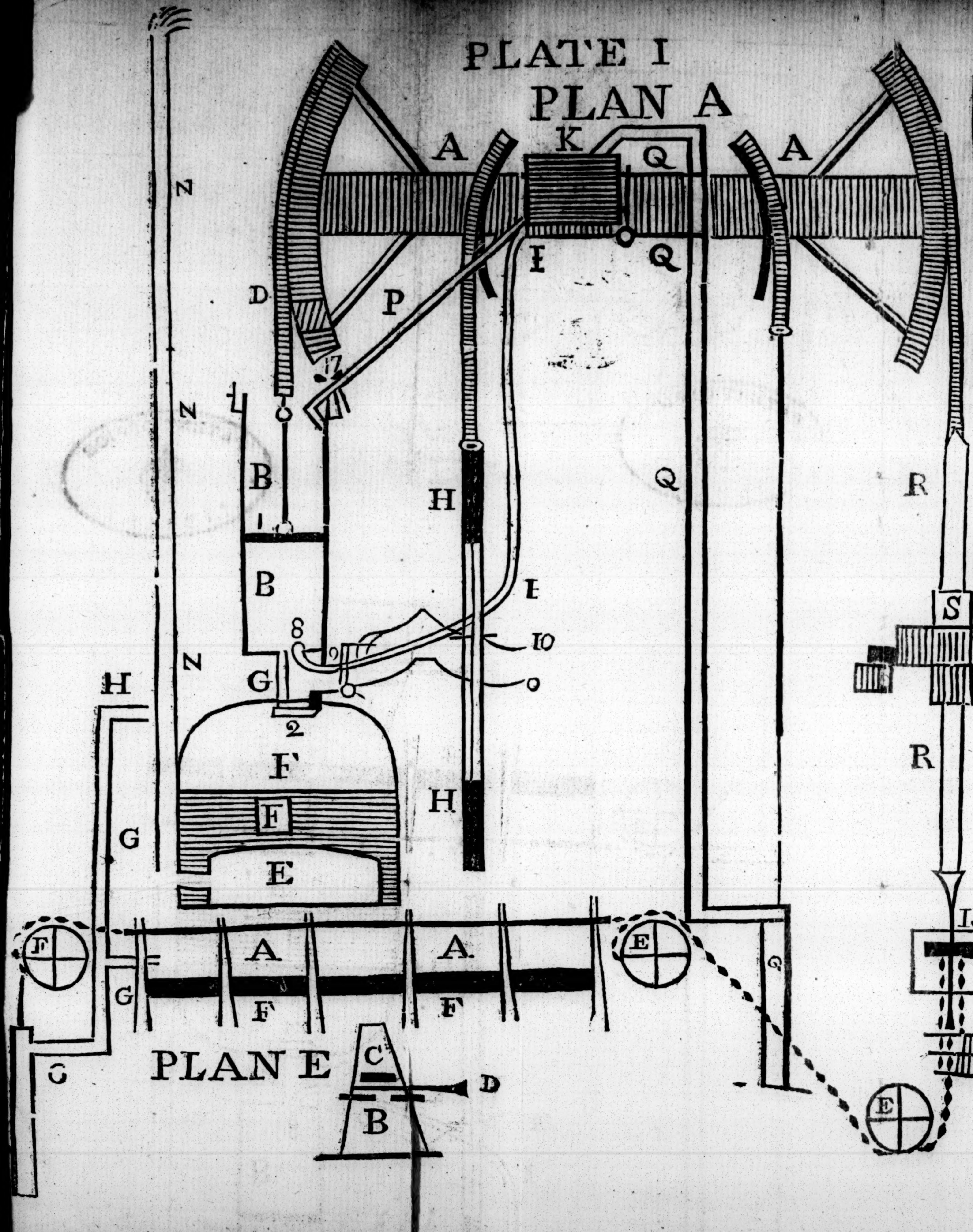
30·1.13.

F I N I S.

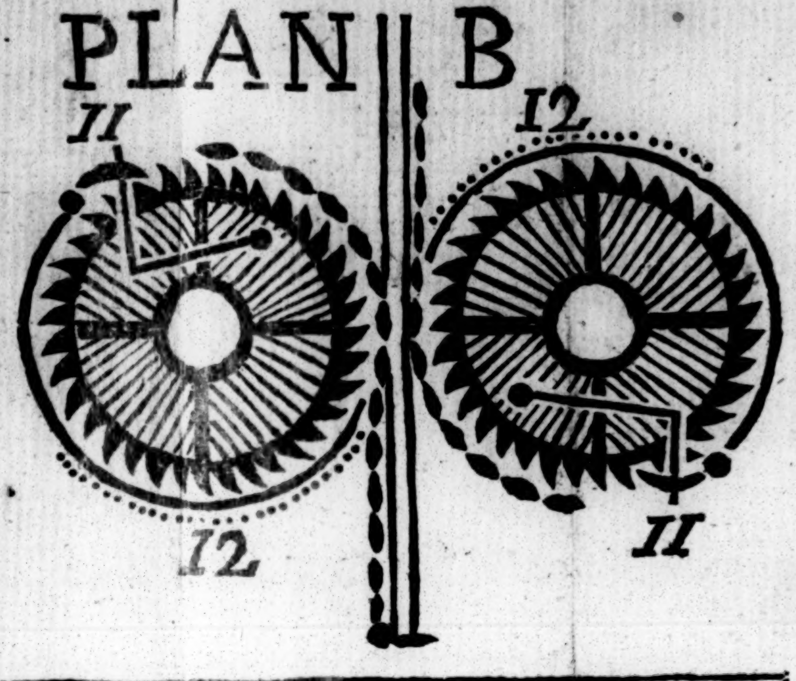
29 APR 70

PLATE I

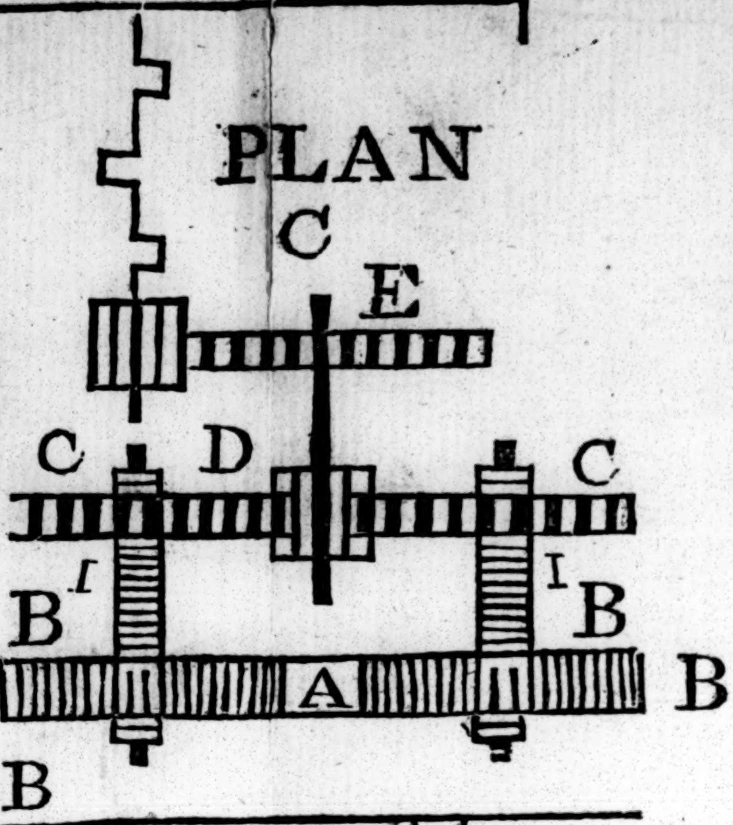
PLAN A



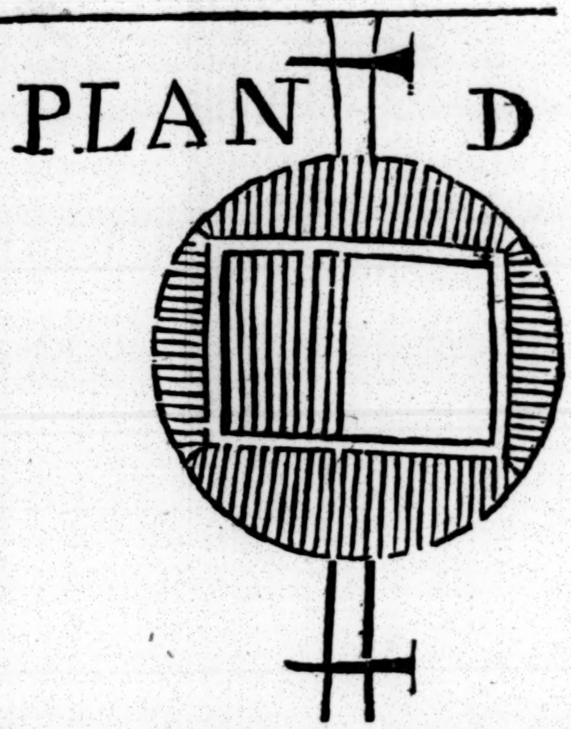
PLAN B

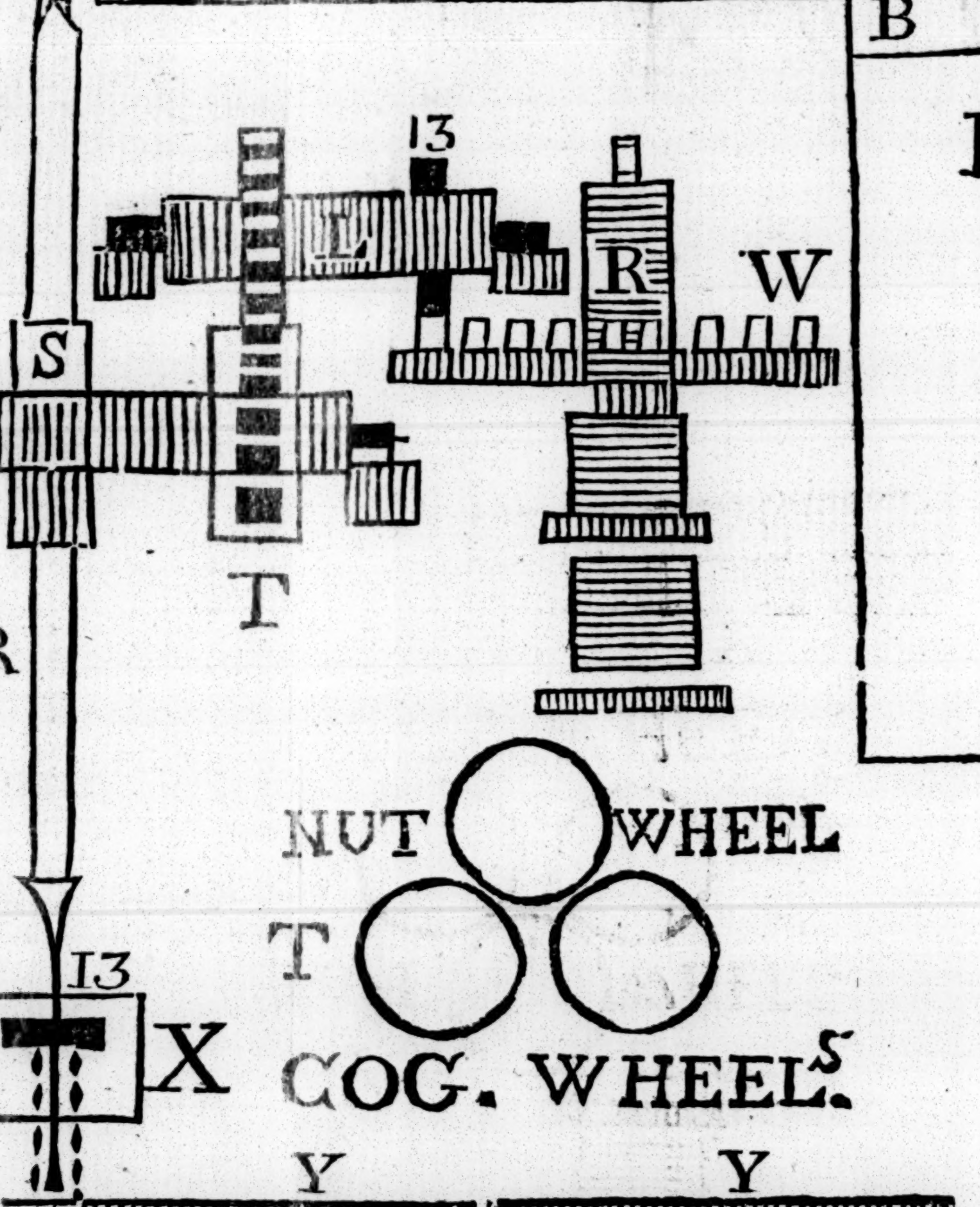


PLAN C



PLAN D





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